

**Source Emissions Testing Report  
BD Medical**

**Ethylene Oxide Sterilization Chamber  
Catalytic Oxidizer  
Columbus, Nebraska**

Report prepared for:  
BD Medical  
920 East 19<sup>th</sup> Street  
Columbus, Nebraska 68601

Report prepared by:  
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Arvada, Colorado 80002

Test Date:  
July 15, 2016

APT Project: BDM6088



## Certification

### Team Leader Certification:

I certify that all of the sampling and analytical procedures and data presented in this report are authentic and accurate.

A handwritten signature in black ink, appearing to read 'Josh Hinchberger'.

Josh Hinchberger  
Field Team Leader / Project Manager

### Reviewer Certification:

I certify that all of the testing details and conclusions are accurate and valid.

A handwritten signature in black ink, appearing to read 'Matt McGregor'.

Matt McGregor  
Reviewer / Technical Writer



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## 1. Introduction

Air Pollution Testing, Inc (APT) was contracted by Becton-Dickinson Medical (BD Medical) for emission testing services at the BD Medical facility located in Columbus, Nebraska.

The purpose of the emissions testing program was to quantify the concentrations and mass flow rates of ethylene oxide into and out of the ethylene oxide sterilization chamber to determine the ethylene oxide destruction removal efficiency (DRE).

The testing was conducted to satisfy applicable requirements imposed by the United States Environmental Protection Agency (EPA) and the Nebraska Department of Environmental Quality (NDEQ). The facility is subject to the emission limits and testing requirements provided in *40 CFR Part 63 National Emission Standards for Hazardous Air Pollutants (NESHAP) Subpart O – Ethylene Oxide Emissions Standards for Sterilization Facilities*. The unit is required to demonstrate 99% DRE.

Table 1.1 provides key project personnel, company affiliations and contact information. Source identification and operating standards are summarized in Table 1.2.

<b>BD Medical – Columbus, Nebraska Ethylene Oxide Catalytic Oxidizer Testing Program Contact Personnel</b>		
<i>Name, Title</i>	<i>Company Address</i>	<i>Phone, Fax, Email</i>
Ms. Sharon Huey, Environmental/Safety Engineer	BD Medical 920 East 19 <sup>th</sup> Street Columbus, Nebraska 68601	402-835-1409, 402-563-8596 fax <a href="mailto:sharon_huey@bd.com">sharon_huey@bd.com</a>
Mr. Brad Pracheil, Compliance Specialist	NDEQ 1200 “N” Street, Suite 400 P.O. Box 98922 Lincoln, Nebraska 68509-8922	402-471-4141, 402-471-2909 fax <a href="mailto:brad.pracheil@nebraska.gov">brad.pracheil@nebraska.gov</a>
Mr. David Maiers, Director of Operations	Air Pollution Testing, Inc. 5530 Marshall Street Arvada, Colorado 80002	303-420-5949 x 33, 303-420-5920 fax <a href="mailto:dmaiers@airtest.net">dmaiers@airtest.net</a>

**Table 1.1: Testing Program Contact Personnel**

<b>BD Medical – Columbus, Nebraska Ethylene Oxide Catalytic Oxidizer Source Identification Summary</b>	
<i>Source Identification</i>	<i>Standards and Operating Limits</i>
Catalytic Oxidizer	Ethylene Oxide DRE ≥ 99% Catalyst bed outlet temperature to be recorded

**Table 1.2: Source Identification Summary**

## 2. Test Results Summary

The results of the testing program are summarized in Table 2.1 on the following page. Any emission parameters not presented in the table may be found in *Appendix 1*. The following terms are used in the table:

- temp °F – degrees Fahrenheit
- %vd – diluent concentration, dry volume percent
- %vw – stack gas moisture content, wet volume percent
- dscfm – stack gas flow rate, dry standard (one atm., 68°F) cubic feet per minute
- lb/hr – pollutant mass emission rate, pounds per hour
- ppmvd – pollutant concentration, parts per million dry volume basis
- DRE – destruction removal efficiency
- C<sub>2</sub>H<sub>4</sub>O – ethylene oxide

<b>BD Medical – Columbus, Nebraska Ethylene Oxide Catalytic Oxidizer: Test Results (July 15, 2016)</b>					
	<i>Run #1</i>	<i>Run #2</i>	<i>Run #3</i>	<b>Average</b>	<b>Permit Limits</b>
Start Time	8:40	9:50	11:00		
Stop Time	9:40	10:50	12:00		
O <sub>2</sub> (%vd)	20.9	20.9	20.9	20.9	
CO <sub>2</sub> (%vd)	0.0	0.0	0.0	0.0	
Stack Temp (°F)	163	176	176	172	
Catalyst Temperature (°F)	231	244	235	237	
H <sub>2</sub> O (%vw)	2.3	2.6	3.0	2.6	
Gas Flow (dscfm)	4,737	4,990	4,826	4,851	
<b>Emissions Data</b>					
C <sub>2</sub> H <sub>4</sub> O (ppmvd)	1.6	1.7	1.7	1.7	
C <sub>2</sub> H <sub>4</sub> O (lb/hr)	0.05	0.06	0.06	0.06	
Inlet C <sub>2</sub> H <sub>4</sub> O (ppmvd)	2,155	1,914	1,561	1,876	
Inlet C <sub>2</sub> H <sub>4</sub> O (lb/hr)	68.1	58.3	50.2	58.8	
<b>Control Efficiency</b>					
C <sub>2</sub> H <sub>4</sub> O (ppmvd)	99.93	99.91	99.89	99.91	<b>99%</b>
<b>DRE</b>					
C <sub>2</sub> H <sub>4</sub> O (lb/hr)	99.92	99.90	99.89	99.91	
The data presented are outlet numbers except where noted.					

**Table 2.1: Ethylene Oxide Catalytic Oxidizer Test Results**

### 3. Methods

#### 3.1. Test Methods

APT tested in accordance with the following U.S. Environmental Protection Agency (EPA) source emission test methods referenced in 40 CFR Part 60, Appendix A.

- *Method 1 – Sample and Velocity Traverses for Stationary Sources*
- *Method 2 – Determination of Stack Gas Velocity and Volumetric Flow Rate*
- *Method 3 – Gas Analysis for the Determination of Dry Molecular Weight*
- *Method 4 – Determination of Moisture Content in Stack Gases*
- *Method 18 – Measurement of Gaseous Organic Compound Emissions by Gas Chromatography*

### 3.2. Method Deviations

At the inlet sampling location, APT did not conduct EPA Method 4 sampling for moisture determination. Moisture determination at the inlet sampling location poses significant ethylene oxide exposure risks. Previous testing at this facility and on identical ethylene oxide sterilization chambers indicate moisture values to be close to ambient conditions for both the inlet and outlet sampling locations. Moisture content was determined from the outlet sampling location only and used for both the inlet and outlet volumetric flow calculations.

### 4. Test Program Summary

The test program determined all of the parameters detailed in Table 4.1.

Three (3), 1-hour test runs were conducted to determine the emission concentrations of ethylene oxide into and out of the sterilization chamber. Concurrent volumetric flow measurements were conducted at the outlet to allow for the calculation of mass emissions. Since the stack gas content is essentially air, a dry molecular weight of 29.0 was assumed. DRE was determined by comparing the inlet and outlet ethylene oxide values on a mass flow basis.

Previous testing at this facility indicated lower than expected inlet ethylene oxide levels, necessitating very low detection limits at the outlet to demonstrate 99% control. The test used direct-interface EPA Method 18 on-site gas chromatographs equipped with flame ionization detectors (GCFID) to determine the inlet and outlet levels of ethylene oxide. The GCFID was calibrated with ethylene oxide balanced nitrogen standards certified to 2% accuracy or dilutions of certified standards.

During the test program, the catalyst bed outlet temperature was monitored by BD Medical personnel and can be found in *Appendix 5*.

<b>BD Medical – Columbus, Nebraska Ethylene Oxide Catalytic Oxidizer Testing Program Sampling and Analytical Methods Summary</b>			
<i>Parameter</i>	<i>Sampling Method</i>	<i>Analytical Method</i>	<i>Laboratory</i>
gas flow rate	Methods 1 and 2	thermocouple, pitot tube and draft gauge	APT, on-site
O <sub>2</sub> , CO <sub>2</sub>	Method 3	wet chemical (Fyrite)	
H <sub>2</sub> O	Method 4	gravimetric	
Ethylene oxide	Method 18	gas chromatograph with flame ionization detector	

**Table 4.1: Sampling and Analytical Methods Summary**

## 5. Test Method Details

### 5.1. Stack Gas Flow, Diluent, and Moisture Content

Stack gas velocity, volumetric flow rate, diluent (O<sub>2</sub> and CO<sub>2</sub>), and moisture (H<sub>2</sub>O) content were measured in accordance with EPA Methods 1, 2, 3 and 4.

Each sampling period consisted of conducting a temperature and differential pressure traverse of each sampling location using a K-type thermocouple and an S-type pitot tube. Concurrent with each traverse, a sample of gas for moisture determination was extracted from the stack at a constant flow rate of no more than 0.75 cubic feet per minute (cfm). The gas sample passed through a stainless steel probe, through a series of four (4) chilled glass impingers, and through a calibrated dry gas meter. Please see *Appendix 4 – Schematics* for a drawing of the EPA Methods 1, 2 and 4 sampling train.

Prior to sampling, the first two impingers were each seeded with 100 milliliters of water. The third impinger was empty. The fourth impinger was seeded with 250 grams of dried silica gel. Following sampling, the moisture gain in the impingers was measured gravimetrically to determine the moisture content of the stack gas.

Concurrent with each velocity traverse, a sample of stack gas was collected in a Tedlar bag for on-site analysis with a Fyrite instrument to determine O<sub>2</sub> and CO<sub>2</sub> concentrations. Since the stack gas content is essentially air, a dry molecular weight of 29.0 was assumed.

All of the above data were combined to calculate the stack gas velocity and volumetric flow rate in units of feet per second (ft/sec), actual cubic feet per minute (acfm), dry standard cubic feet per minute (dscfm), and pounds per hour (lb/hr).

### 5.2. Ethylene Oxide

Ethylene oxide levels were determined in accordance with EPA Method 18 using the direct interface sampling and analysis procedures detailed in the method. Samples were analyzed on-site with two HP Model 5890 Series II Gas Chromatographs (GC) equipped with a flame ionization detector (FID) and Chemstation software.

Using a heated sample probe/line, stack gas was transported directly to the gas sampling valve of each GC. Samples were analyzed approximately once each 10 minutes. A “test run” consisted of five (5) consecutive injections. Three test runs were conducted (for a total of 15 injections) at the inlet and outlet of the catalytic oxidizer.

Prior to sampling, gas phase calibration standards were prepared by dilution of a +/-2% accuracy certified gas standard. Preparation of diluted standards was conducted using a gas-tight volumetric syringe and new Tedlar bags. Triplicate (minimum, more if required to meet the 5% agreement limit) injections were conducted for each standard, and a calibration curve of peak area versus concentration was prepared. A least squares line

( $y=mx$ ) was fit to each data set. A line loss test was conducted to ensure adequate sampling system performance.

Following analysis of stack gas samples, the mid-level calibration standard was re-analyzed at the gas sampling valve in triplicate. Because the average of the initial calibration response (triplicate average) and the post-test check response (triplicate average) were within 5% of their mean value, the initial calibration linear regression data were used to quantify the emission levels for each GC.

The results of the GC analysis were used to calculate ethylene oxide levels in units of parts per million, wet volume basis (ppmvw). The data were combined with stack gas volumetric flow rate data to calculate emissions in units of pounds per hour (lb/hr). Catalytic oxidizer DRE was calculated on a mass basis.

## **6. Conclusions**

The testing conducted by APT on the ethylene oxide catalytic oxidizer at the BD Medical facility in Columbus, Nebraska on July 15, 2016 demonstrates that the unit is operating in compliance with the emission limits imposed by the EPA and the NDEQ.



Appendix One: Testing Parameters / Sample Calculations

BD Medical  
Columbus, Nebraska  
Catalytic Oxidizer  
7/15/2016

Field Reference Method Data (Inlet)					
Run #		1	2	3	Average
	Start Time	8:40	9:50	11:00	
	Stop Time	9:40	10:50	12:00	
	Sample Time	60	60	60	
hrs	Hours of Operation / Year	8,760	8,760	8,760	8,760
D <sub>s</sub>	Stack Diameter (inches)	23.25	23.25	23.25	23.25
$\sqrt{\Delta P_{AVG}}$	(Delta P) <sup>1/2</sup>	0.4914	0.4745	0.5036	0.4898
C <sub>p</sub>	Pitot Tube Constant (unitless)	0.837	0.837	0.837	0.837
T <sub>s</sub>	Stack Temp (°F)	67	68	70	68
P <sub>bar</sub>	Barometric Press (mbar)	960	960	960	960
P <sub>bar</sub>	Barometric Press ("Hg)	28.35	28.35	28.35	28.35
P <sub>s</sub>	Stack Pressure ("H <sub>2</sub> O)	-7.2	-7.2	-7.2	-7.2
Y <sub>d</sub>	Meter Y Factor (unitless)	0.998	0.998	0.998	0.998
T <sub>m</sub>	Meter Temperature (°F)	69	74	77	73
V <sub>m</sub>	Sample Volume (ft <sup>3</sup> )	36.106	36.507	36.803	36.472
ΔH	Delta H ("H <sub>2</sub> O)	1.0	1.0	1.0	1.0
V <sub>ic</sub>	Moisture (grams)	16.8	19.2	22.3	19
O <sub>2</sub> %vd	O <sub>2</sub> (%vd)	20.9	20.9	20.9	20.9
CO <sub>2</sub> %vd	CO <sub>2</sub> (%vd)	0.0	0.0	0.0	0
N <sub>2</sub> %vd	N <sub>2</sub> (%vd)	79.1	79.1	79.1	79.1

Field Reference Method Data (Outlet)					
Run #		1	2	3	Average
	Start Time	8:40	9:50	11:00	
	Stop Time	9:40	10:50	12:00	
	Sample Time	60	60	60	
	Hours of Operation / Year	8,760	8,760	8,760	8,760
	Stack Diameter (inches)	23.5	23.5	23.5	23.5
	(Delta P) <sup>1/2</sup>	0.5326	0.5683	0.5515	0.5508
	Pitot Tube Constant (unitless)	0.837	0.837	0.837	0.837
	Stack Temp (°F)	163	176	176	172
	Barometric Press (mbar)	960	960	960	960
	Barometric Press ("Hg)	28.35	28.35	28.35	28.35
	Stack Pressure ("H <sub>2</sub> O)	-0.25	-0.25	-0.25	-0.25
	Meter Y Factor (unitless)	0.998	0.998	0.998	0.998
	Meter Temperature (°F)	69	74	77	73
	Sample Volume (ft <sup>3</sup> )	36.106	36.507	36.803	36.472
	Delta H ("H <sub>2</sub> O)	1.0	1.0	1.0	1.0
	Moisture (grams)	16.8	19.2	22.3	19.4
	O <sub>2</sub> (%vd)	20.9	20.9	20.9	20.9
	CO <sub>2</sub> (%vd)	0.0	0.0	0.0	0.0
	N <sub>2</sub> (%vd)	79.1	79.1	79.1	79.1

Method 18 GC Data (Inlet)					
MW	Run #	1	2	3	Average
44.05	Ethylene Oxide (ppmvw)	2,106	1,867	1,519	1,831

Method 18 GC Data (Outlet)			
1	2	3	Average
1.6	1.6	1.7	1.6

Reference Method Calculations (Inlet)					
Run #		1	2	3	Average
V <sub>mstd</sub>	Sample Volume (dscf)	34.178	34.233	34.305	34.239
V <sub>wstd</sub>	Moisture Volume (scf)	0.79	0.90	1.05	0.91
B <sub>ws</sub>	Moisture Content (%/100)	0.023	0.025	0.027	0.025
M <sub>D</sub>	Molecular Weight Dry	28.84	28.84	28.84	28.84
M <sub>A</sub>	Molecular Weight Wet	28.59	28.57	28.55	28.569
V <sub>s</sub>	Gas Velocity (ft/sec)	28.6	27.7	29.4	28.58
F <sub>ACFM</sub>	Gas Flow (acfm)	5,065	4,894	5,209	5,056
F <sub>DSCFM</sub>	Gas Flow (dscfm)	4,608	4,441	4,693	4,581
lb/hr	Gas Flow (lb/hr)	20,991	20,255	21,437	20,894
	Ethylene Oxide (ppmvd)	2,155	1,914	1,561	1,876
	Ethylene Oxide (lb/hr)	68.1	58.3	50.2	58.8
	Ethylene Oxide (tpy)	298	255	220	258

Reference Method Calculations (Outlet)			
1	2	3	Average
34.178	34.233	34.305	34.239
0.79	0.90	1.05	0.91
0.023	0.026	0.030	0.026
28.84	28.84	28.84	28.84
28.59	28.56	28.51	28.55
33.4	36.1	35.0	34.8
6,041	6,516	6,329	6,295
4,737	4,990	4,826	4,851
21,579	22,776	22,086	22,147
1.6	1.7	1.7	1.7
0.05	0.06	0.06	0.06
0.23	0.25	0.25	0.24

DRE Calculations					
Run #		1	2	3	Average
dry	Inlet C <sub>2</sub> H <sub>4</sub> O (ppmvd)	2,155	1,914	1,561	1,876
lb/hr	Inlet C <sub>2</sub> H <sub>4</sub> O (lb/hr)	68.1	58.3	50.2	58.8
dry	Outlet C <sub>2</sub> H <sub>4</sub> O (ppmvd)	1.6	1.7	1.7	1.7
lb/hr	Outlet C <sub>2</sub> H <sub>4</sub> O (lb/hr)	0.05	0.06	0.06	0.06
Eff %	Control Eff % C <sub>2</sub> H <sub>4</sub> O (ppmvd)	99.93%	99.91%	99.89%	99.91%
DRE	% DRE C <sub>2</sub> H <sub>4</sub> O (lb/hr)	99.92%	99.90%	99.89%	99.91%

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 EPA Method 18: Determination of Gaseous Organic Compounds using Gas Chromatography

Sample Analysis (Inlet)

Run 1													
Cpd	Inj. 1	Sig.20027	Inj. 2	Sig.20028	Inj. 3	Sig.20029	Inj. 4	Sig.20030	Inj. 5	Sig.20031	Average		
ID	RT	AC	RT	AC	ppm								
Ethylene Oxide	1.307	108521.1	1.308	119831.5	1.298	36081.7	1.291	110062.1	1.282	110062.1	n/a	96912	2105.82
Run 2													
Cpd	Inj. 1	Sig.20032	Inj. 2	Sig.20033	Inj. 3	Sig.20034	Inj. 4	Sig.20035	Inj. 5	Sig.20036	Average		
ID	RT	AC	RT	AC	ppm								
Ethylene Oxide	1.277	107743.2	1.277	107144.5	1.267	98779.1	1.260	93773.9	1.25	22174.2	1.266	85923	1867.05
Run 3													
Cpd	Inj. 1	Sig.20037	Inj. 2	Sig.20038	Inj. 3	Sig.20039	Inj. 4	Sig.20040	Inj. 5	Sig.20041	Average		
ID	RT	AC	RT	AC	ppm								
Ethylene Oxide	1.246	81675.1	1.24	75542.3	1.234	66980.6	1.228	63400.4	1.226	61917	1.235	69903	1518.94

Sample Analysis (Outlet)

Run 1													
Cpd	Inj. 1	Sig.10027	Inj. 2	Sig.10028	Inj. 3	Sig.10029	Inj. 4	Sig.10030	Inj. 5	Sig.10031	Average		
ID	RT	AC	RT	AC	ppm								
Ethylene Oxide	1.456	3186	1.473	2067.6	1.476	2824.7	1.459	2982.0	1.432	3356.7	1.459	2883	1.55
Run 2													
Cpd	Inj. 1	Sig.10032	Inj. 2	Sig.10033	Inj. 3	Sig.10034	Inj. 4	Sig.10035	Inj. 5	Sig.10036	Average		
ID	RT	AC	RT	AC	ppm								
Ethylene Oxide	1.454	2776.6	1.449	2815.2	1.446	3302	1.457	2534.8	1.438	3721.2	1.449	3030	1.63
Run 3													
Cpd	Inj. 1	Sig.10037	Inj. 2	Sig.10038	Inj. 3	Sig.10039	Inj. 4	Sig.10040	Inj. 5	Sig.10041	Average		
ID	RT	AC	RT	AC	ppm								
Ethylene Oxide	1.450	2532.8	1.460	3132.1	1.427	3661.2	1.432	3001.3	1.443	3081.7	1.442	3082	1.66

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Initial Three-Point Calibration										
(Inlet) High Level Calibration Standard										
Cpd ID	Conc. (ppm)	Inj. 1 RT	Sig.20009 AC	Inj. 2 RT	Sig.20010 AC	Inj. 3 RT	Sig.20011 AC	RT	Average AC	OK?
Ethylene Oxide	5210.00	1.178	246335.0	1.177	243749.4	1.175	245096.1	1.177	245060	Y
Mid-Level Calibration Standard										
Cpd ID	Conc. (ppm)	Inj. 1 RT	Sig.20012 AC	Inj. 2 RT	Sig.20013 AC	Inj. 3 RT	Sig.20014 AC	RT	Average AC	OK?
Ethylene Oxide	2605.00	1.17	114924.2	1.168	110556.5	1.166	109134.5	1.168	111538	Y
Low-Level Calibration Standard										
Cpd ID	Conc. (ppm)	Inj. 1 RT	Sig.20015 AC	Inj. 2 RT	Sig.20016 AC	Inj. 3 RT	Sig.20017 AC	RT	Average AC	OK?
Ethylene Oxide	1302.50	1.162	53066.9	1.158	52767.1	1.158	53299.9	1.159	53045	Y

Six-Point
Pre/Post Average AC
245060

Pre/Post Average AC
111538

Pre/Post Average AC
53045

Initial Three-Point Calibration										
(Outlet) Low Level Calibration Standard										
Cpd ID	Conc. (ppm)	Inj. 1 RT	Sig.10009 AC	Inj. 2 RT	Sig.10010 AC	Inj. 3 RT	Sig.10011 AC	RT	Average AC	OK?
Ethylene Oxide	51.50	1.366	95228.1	1.366	96120	1.365	95286.2	1.366	95545	Y
Mid-Level Calibration Standard										
Cpd ID	Conc. (ppm)	Inj. 1 RT	Sig.10012 AC	Inj. 2 RT	Sig.10013 AC	Inj. 3 RT	Sig.10014 AC	RT	Average AC	OK?
Ethylene Oxide	25.75	1.363	48831.7	1.363	45445.5	1.362	46496.2	1.363	46924	Y
Low-Level Calibration Standard										
Cpd ID	Conc. (ppm)	Inj. 1 RT	Sig.10015 AC	Inj. 2 RT	Sig.10016 AC	Inj. 3 RT	Sig.10017 AC	RT	Average AC	OK?
Ethylene Oxide	12.88	1.36	25781.4	1.358	24112.5	1.358	25815.4	1.359	25236	Y

Six-Point
Pre/Post Average AC
95545

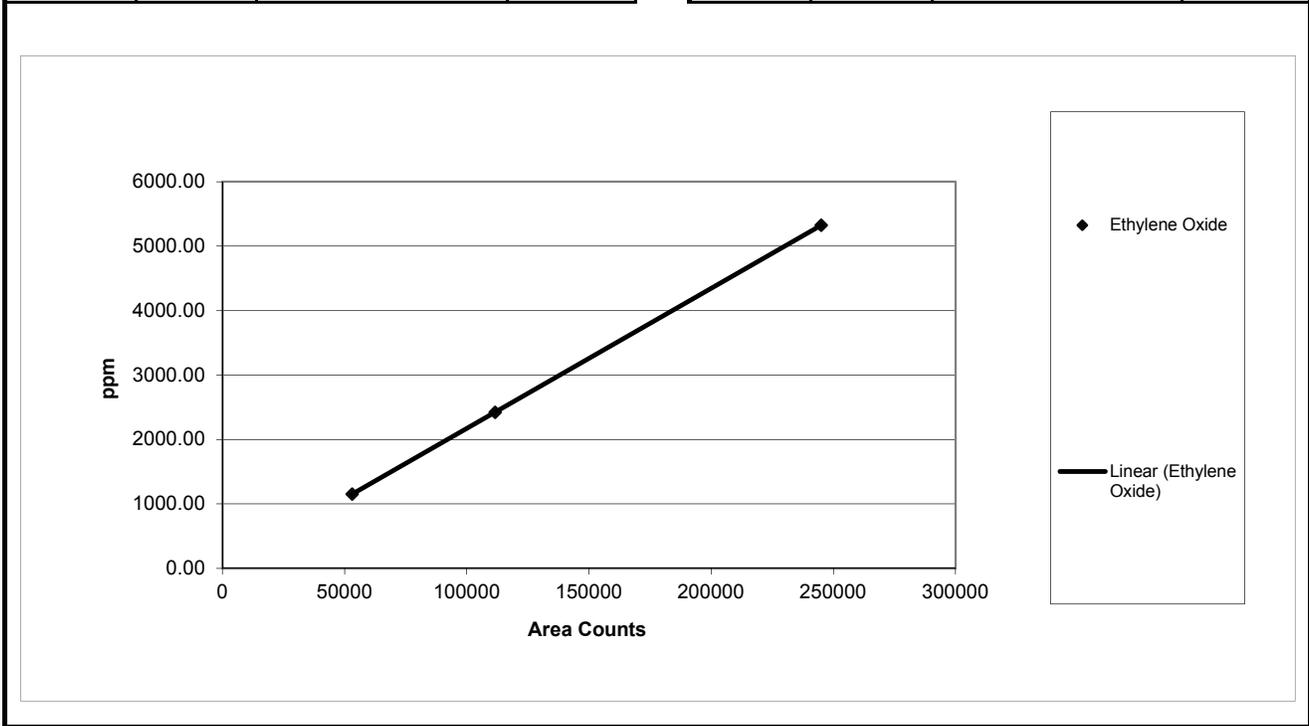
Pre/Post Average AC
46924

Pre/Post Average AC
25236

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EPA Method 18: Determination of Gaseous Organic Compounds using Gas Chromatography

Linear Regression Calculations									
Ethylene Oxide					Ethylene Oxide				
Certified ppm	Average AC	Linear Regression Statistics		ppm from curve	Certified ppm	Average AC	Linear Regression Statistics		ppm from curve
5210.00	245060	R <sup>2</sup>	M	5324.98	51.50	95545	R <sup>2</sup>	M	51.52
2605.00	111538	0.9990	0.0217293	2423.65	25.75	46924	0.9992	0.0005393	25.31
1302.50	53045			1152.62	12.88	25236			13.61



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 EPA Method 18: Determination of Gaseous Organic Compounds using Gas Chromatography

Quality Assurance Inlet												
Inlet Line Loss Check (mid-level calibration gas to the sample probe)												
Cpd ID	Conc. (ppm)	Inj. 1	Sig.20018	Inj. 2	Sig.20019	Inj. 3	Sig.20020	Average			Triplicate OK?	Recovery OK?
		RT	AC	RT	AC	RT	AC	RT	AC	ppm		
Ethylene Oxide	5210.00	1.137	251461.0	1.135	247674.4	1.132	248526.3	1.135	249221	5415.39	Y	Y

Inlet Post Test Calibration Check (mid-level calibration gas to the gas sampling valve)												
Cpd ID	Conc. (ppm)	Inj. 1	Sig.20042	Inj. 2	Sig.20043	Inj. 3		Average			Triplicate OK?	Pre/Post OK?
		RT	AC	RT	AC	RT	AC	RT	AC	ppm		
Ethylene Oxide	2605.00	1.237	105265.4	1.25	114268.7	1.256	113748.3	1.248	111094	2414.00	Y	Y

Quality Assurance Outlet												
Outlet Line Loss Check (mid-level calibration gas to the sample probe)												
Cpd ID	Conc. (ppm)	Inj. 1	Sig.10018	Inj. 2	Sig.10019	Inj. 3	Sig.10020	Average			Triplicate OK?	Recovery OK?
		RT	AC	RT	AC	RT	AC	RT	AC	ppm		
Ethylene Oxide	51.50	1.347	89318.4	1.347	90464.3	1.346	90949.7	1.347	90244	48.67	Y	Y

Outlet Post Test Calibration Check (mid-level calibration gas to the gas sampling valve)												
Cpd ID	Conc. (ppm)	Inj. 1	Sig.10043	Inj. 2	Sig.10044	Inj. 3	Sig.10045	Average			Triplicate OK?	Pre/Post OK?
		RT	AC	RT	AC	RT	AC	RT	AC	ppm		
Ethylene Oxide	25.75	1.384	47937.7	1.387	48601.2	1.389	47332.1	1.387	47957	25.86	Y	Y

## **Sample Calculations**

BD Medical  
 Columbus, Nebraska  
 Catalytic Oxidizer Outlet - Run 1  
 7/15/2016

EPA Methods 1-4: Determination of Stack Gas Velocity and Volumetric Flow Rate

Sample Calculations

$$\begin{aligned} \text{sample volume (scf)} &= \frac{17.64 * V_M * Y_D * \{P_B + \Delta H/13.6\}}{T_M + 460} \\ &= \frac{17.64 * 36.106 * 0.998 * \{ 28.35 + 1.0 / 13.6\}}{69 + 460} \\ &= 34.178 \end{aligned}$$

$$\begin{aligned} \text{moisture volume (scf)} &= 0.04715 * V_{LC} \\ &= 0.04715 * 16.8 \\ &= 0.791 \end{aligned}$$

$$\begin{aligned} \text{moisture content (\% / 100)} &= \frac{V_{W(STD)}}{(V_{M(STD)} + V_{W(STD)})} \\ &= \frac{0.791}{( 34.178 + 0.791 )} \\ &= 0.023 \end{aligned}$$

$$\begin{aligned} \text{molecular weight, dry (grams/mol)} &= (0.440) * (\%CO_2) + (0.320) * (\%O_2) + (0.280) * (\%N_2 + \%CO) \\ &= (0.440) * 0.0 + (0.320) * 20.9 + (0.280) * ( 79.1 + 0.0) \\ &= 28.84 \end{aligned}$$

$$\begin{aligned} \text{molecular weight, actual (grams/mol)} &= M_D * (1 - B_{WS}) + (18.0) * B_{WS} \\ &= 28.84 * (1 - 0.023) + (18 * 0.023) \\ &= 28.59 \end{aligned}$$

BD Medical  
 Columbus, Nebraska  
 Catalytic Oxidizer Outlet - Run 1  
 7/15/2016

EPA Methods 1-4: Determination of Stack Gas Velocity and Volumetric Flow Rate

Sample Calculations (continued)

$$\begin{aligned}
 \text{gas velocity (ft/sec)} &= 85.49 * C_P * \sqrt{\Delta P_{AVG}} * \sqrt{\frac{T_S + 460}{[P_B + P_S / 13.6] * M_A}} \\
 &= (85.49) * 0.837 * 0.5326 * \sqrt{\frac{163 + 460}{\left[ \frac{28.35 + \frac{-0.25}{13.6}}{28.59} \right]}} \\
 &= 33.4
 \end{aligned}$$

$$\begin{aligned}
 \text{gas flow (acfm)} &= 60 * \frac{\pi * (D_S / 12)^2}{4} * V_S \\
 &= 60 * \frac{\pi * (23.5 / 12)^2}{4} * 33.4 \\
 &= 6,041
 \end{aligned}$$

$$\begin{aligned}
 \text{gas flow (dscfm)} &= 60 * V_S * (1 - B_{WS}) * \frac{\pi * (D_S / 12)^2}{4} * \frac{T_{STD} * [P_B + P_S / 13.6]}{(T_S + 460) * P_{STD}} \\
 &= 60 * 33.4 * (1 - 0.023) * \frac{\pi * (23.5 / 12)^2}{4} * \frac{528 * [28.35 + \frac{-0.25}{13.6}]}{(163 + 460) * 29.92} \\
 &= 4,737
 \end{aligned}$$

**BD Medical**  
**Columbus, Nebraska**  
**Catalytic Oxidizer Outlet - Run 1**  
**7/15/2016**

**EPA Methods 1-4: Determination of Stack Gas Velocity and Volumetric Flow Rate**

**Variables and Abbreviations**

$B_{WS}$  - moisture content of the gas (wet volume percent/100)

%CO - carbon monoxide content of the gas (dry volume percent)

%CO<sub>2</sub> - carbon dioxide content of the gas (dry volume percent)

$C_P$  - pitot tube constant (unitless)

$D_S$  - diameter of the stack (inches)

$\Delta H$  - pressure differential at dry gas meter exit orifice (inches water)

$M_D$  - molecular weight of the dry gas (grams per mol)

$M_A$  - molecular weight of the wet gas (grams per mol)

%N<sub>2</sub> - nitrogen content of the gas (dry volume percent)

%O<sub>2</sub> - oxygen content of the gas (dry volume percent)

$P_{AVG}$  - average square root of the stack gas pitot differential pressure (inches water)

$P_B$  - barometric pressure (inches mercury)

$P_S$  - stack pressure relative to barometric pressure (inches water)

$P_{STD}$  - standard pressure (29.92 inches mercury)

$T_M$  - average dry gas meter temperature (°F)

$T_S$  - average stack temperature (°F)

$T_{STD}$  - standard temperature (528 °R)

$V_{LC}$  - volume of moisture collected as a liquid (milliliters)

$V_M$  - volume indicated on dry gas meter (uncorrected actual cubic feet)

$V_{MSTD}$  - volume of gas through dry gas meter (corrected dry standard cubic feet)

$V_S$  - stack gas velocity (feet per second)

$V_{WSTD}$  - volume of moisture collected as a gas at standard conditions (standard cubic feet)

$Y_D$  - dry gas meter calibration factor (unitless)

BD Medical  
Columbus, Nebraska  
Catalytic Oxidizer Inlet - Run 1  
07/15/16

EPA Method 18: Measurement of Gaseous Organic Compounds by Gas Chromatography

**Sample Calculations**

$$\begin{aligned} \text{EO conc (ppmvd as C}_3\text{H}_8) &= \frac{[\text{EO conc (ppmvw)}]}{(1 - B_{\text{WS}})} \\ &= \frac{2106.0}{(1 - 0.023)} \\ &= 2155 \end{aligned}$$

$$\begin{aligned} \text{EO emissions (lb/hr)} &= [\text{EO (ppmvd)}] * (F_{\text{DSCFM}}) * (1.556 \times 10^{-7}) * (44.05) \\ &= (2155) * (4,608) * (1.556 \times 10^{-7}) * 44.05 \\ &= 68.1 \end{aligned}$$

$$\begin{aligned} \text{EO emissions (tons/year)} &= \frac{[\text{EO emissions (lb/hr)}] * [8,760 \text{ (hours/year)}]}{[2,000 \text{ (pounds/ton)}]} \\ &= (68.1) * \frac{(8760)}{(2000)} \\ &= 298 \end{aligned}$$

**Variables and Abbreviations**

EO - ethylen oxide

B<sub>WS</sub> - moisture content of the gas (wet volume percent/100)

cal - calibrated

conc - concentration

F<sub>DSCFM</sub> - gas flow (dry standard cubic feet per minute, where standard = 29.92 inches Hg and 68°F)

lb/hr - pounds per hour

tpy - tons per year

ppmvw - parts per million, wet volume basis

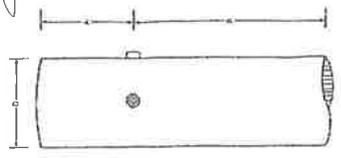


Appendix Two: Field Data

### Air Pollution Testing, Inc. : EPA Method 4 - Moisture Determination Datasheet

APT Job #: **BDM 6088**      Date: **7/15/16**      CO<sub>2</sub> (%): **CDAs**      O<sub>2</sub> (%): **CDAs**  
 Location: **Qutjrt**      Operator: **A. Pisk...**      Ambient Temperature (°F): **65**      Barometric Press (mbar): **960**  
 Run # **1**      Meter Box ID: **M5-27**      Probe Length (ft): **~3'**      Moisture (grams): **16.8**  
 Meter Box Y<sub>d</sub>: **0.998**      Meter ΔH@: **1.15**      Static Pressure (" H<sub>2</sub>O): **-0.25**      Start Time: **0840**  
 Pre-Test Pump Leak Check: **0.0 @ 15" Hg**      Post-Test Pump Leak Check: **0.0 @ 15" Hg**      Method: **4**      Stop Time: **0940**

Sampling Time (minutes)	Vacuum (" Hg)	ΔH Orifice Setting (" H <sub>2</sub> O)	T <sub>m</sub> Meter Temp.		Condenser Temp. (°F)	Probe Temp. (°F)	Meter Volume (ft <sup>3</sup> )	Notes		
			Inlet (°F)	Outlet (°F)						
5	2	1.0	67	65	65	248	218.2			
10	2	1.0	68	66	64	249	271.2			
15	2	1.0	68	66	64	250	274.2			
20	2	1.0	69	66	63	250	277.3			
25	2	1.0	70	66	63	250	280.3			
30	2	1.0	71	66	63	251	283.2			
35	2	1.0	72	66	64	250	286.3			
40	2	1.0	73	66	64	251	289.3			
45	2	1.0	74	66	63	250	292.3			
50	2	1.0	74	66	63	250	295.3			
55	2	1.0	74	66	64	249	298.2			
60	2	1.0	75	66	64	250	301.336			
Total										
maximum								average	difference	
(2)								(68.6)	(65)	(36.106)



Stack ID (inches): **23 1/4**  
 Upstream Disturbance (inches):  
 Downstream Disturbance (inches):  
 200 gram Field Check of Scale (value):

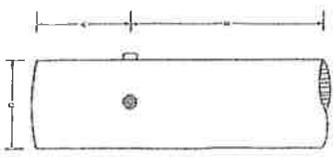
Moisture Determination			
Imp. #	Tare	Final	Gain
1	453.2	441.7	
2	458.8	477.9	19.1
3	277.4	298.7	1.3
4	557.4	565.3	
Total	1766.8	1783.6	(16.8)

Technician's Signature: *[Signature]*  
 Project Leader's Signature: *[Signature]*

### Air Pollution Testing, Inc. : EPA Method 4 - Moisture Determination Datasheet

APT Job #: BDM 6088      Date: 7/15/16      CO<sub>2</sub> (%): LDAS      O<sub>2</sub> (%): LDAS  
 Location: 04144      Operator: A. Piskin      Ambient Temperature (°F): 65      Barometric Press (mbar): 910  
 Run #: 2      Meter Box ID: M5-27      Probe Length (ft): ~3'      Moisture (grams): 19.2  
 Meter Box Yd: 0.998      Meter ΔH@: 1.65      Static Pressure (" H<sub>2</sub>O): -0.25      Start Time: 0950  
 Pre-Test Pump Leak Check: 0.0 @ 15" Hg      Post-Test Pump Leak Check: 0.0 @ 15" Hg      Method: 4      Stop Time: 1050

Sampling Time (minutes)	Vacuum (" Hg)	ΔH Orifice Setting (" H <sub>2</sub> O)	T <sub>m</sub> Meter Temp.		Condenser Temp. (°F)	Probe Temp. (°F)	Metér Volume (ft <sup>3</sup> )	Notes
			Inlet (°F)	Outlet (°F)				
5	2	1.0	74	67	61	244	301.381	
10	2	1.0	74	67	62	251	304.8	
15	2	1.0	75	68	63	250	307.4	
20	2	1.0	76	69	63	250	310.5	
25	2	1.0	77	70	63	250	313.5	
30	2	1.0	78	70	63	250	316.6	
35	2	1.0	78	71	64	244	319.6	
40	2	1.0	79	71	64	251	322.7	
45	2	1.0	79	71	65	250	325.7	
50	2	1.0	79	72	65	250	328.0	
55	2	1.0	79	72	66	251	331.8	
60	2	1.0	79	72	66	250	334.9	
							337.888	



Stack ID (inches): \_\_\_\_\_  
 Upstream Disturbance (inches): \_\_\_\_\_  
 Downstream Disturbance (inches): \_\_\_\_\_  
 200 gram Field Check of Scale (value): \_\_\_\_\_

Moisture Determination			
Imp. #	Tare	Final	Gain
1	441.7	435.4	
2	435.8	433.2	
3	296.8	297.7	
4	565.3	572.5	
Total	1739.6	1758.8	19.2

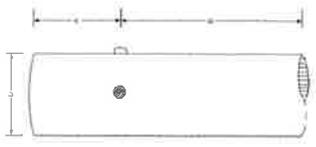
Project Leader's Signature: [Signature]

total	maximum	average	maximum	average	difference
60	2	73.6	66	250.1	36.507

### Air Pollution Testing, Inc. : EPA Method 4 - Moisture Determination Datasheet

APT Job #: BDM 6088 Date: 7/5/16 CO<sub>2</sub> (%): CO<sub>2</sub> O<sub>2</sub> (%): CO<sub>2</sub>  
 Location: outlet Operator: A. Pyskun Ambient Temperature (°F): 65 Barometric Press (mbar): 960  
 Run # 3 Meter Box ID: M5-27 Probe Length (ft): ~3' Moisture (grams): 22.3  
 Meter Box Y<sub>d</sub>: 0.998 Meter ΔH@: 1.65 Static Pressure ("H<sub>2</sub>O): -0.25 Start Time: 1100  
 Pre-Test Pump Leak Check: 0.0 @ 15" Hg Post-Test Pump Leak Check: 0.0 @ 15" Hg Method: 4 Stop Time: 1200

Sampling Time (minutes)	Vacuum ("Hg)	ΔH Orifice Setting ("H <sub>2</sub> O)	T <sub>m</sub> Meter Temp.		Condenser Temp. (°F)	Meter Volume (ft <sup>3</sup> )	Notes
			Inlet (°F)	Outlet (°F)			
5	2	1.0	76	72	59	337.969	Probe Temp (°F)
10	2	1.0	76	72	59	341.0	250
15	2	1.0	79	73	60	344.1	250
20	2	1.0	77	73	60	347.1	249
25	2	1.0	80	73	60	350.1	250
30	2	1.0	80	74	61	353.2	251
35	2	1.0	81	74	62	356.3	250
40	2	1.0	82	74	62	359.4	250
45	2	1.0	82	74	63	362.4	249
50	2	1.0	82	75	63	365.6	250
55	2	1.0	82	75	64	368.6	250
60	2	1.0	82	75	64	371.7	251
						374.772	250



Schematic of Stack :

Stack ID (inches):  
 Upstream Disturbance (inches):  
 Downstream Disturbance (inches):

Moisture Determination			
Imp. #	Tare	Final	Gain
1	435.4	435.9	
2	453.2	465.2	
3	296.9	297.7	
4	572.5	579.5	
Total	1758	1780.3	22.3

Technician's Signature: \_\_\_\_\_  
 Project Leader's Signature: \_\_\_\_\_

total maximum average difference  
60 2 1.0 76.8 61.4 36.803 Average 250. F

### Air Pollution Testing Inc. : EPA Method 2 - Pitot Traverse Datasheet

**Job #:** BDM 6088 ~~PWFE5660-~~  
**Facility:** inlet  
**Date:** 7/15/16  
**Probe ID:** P-882  
**Pitot Constant:** 0.837  
**Pitot Tube Visual Check:** good

**Operator:** AP/KM  
**Site:** inlet  
**Points:** 1 5.3 5 70.7 9  
 2 6.9 6 73.7 10  
 3 9 7 75.3 11  
 4 12 8 27 12

**Stack Diameter (inches):** 23.25  
**Upstream Disturbance (inches):**  
**Downstream Disturbance (inches):**  
**Schematic of Sampling Location:** 4.5" Pit

Run #:	1	2	3
O2%:	CDAS	CDAS	CDAS
H2O%:	CDAS	CDAS	CDAS
Ps ("H2O):	-7.2	-7.2	-7.2
Start Time:	0845	1015	1120
Stop Time:	0855	1025	1130
Post Test Pitot Leak Check Good? :	0.0 @ 3.3" H <sub>2</sub> O	0.0 @ 3.5" H <sub>2</sub> O	0.0 @ 4.3" H <sub>2</sub> O
Point #	Delta P	Ts	Notes
1-1	0.31	66	
1-2	0.29	67	
1-3	0.27	67	
1-4	0.25	68	
1-5	0.22	67	
1-6	0.24	68	
1-7	0.21	68	
1-8	0.20	68	
2-1	0.27	67	
2-2	0.26	68	
2-3	0.26	69	
2-4	0.23	68	
2-5	0.24	67	
2-6	0.21	67	
2-7	0.22	67	
2-8	0.20	67	
1-1	0.22	69	
1-2	0.23	70	
1-3	0.24	70	
1-4	0.24	69	
1-5	0.26	70	
1-6	0.27	70	
1-7	0.30	70	
1-8	0.30	71	
2-1	0.24	70	
2-2	0.22	70	
2-3	0.22	71	
2-4	0.26	71	
2-5	0.24	71	
2-6	0.25	70	
2-7	0.24	71	
2-8	0.24	71	

**Averages:** 0.4914 67.4  
**Averages:** 0.4745 67.75  
**Averages:** 0.5036 70.25

**Reviewers Signature:** \_\_\_\_\_

**Air Pollution Testing Inc. : EPA Method 2 - Pitot Traverse Datasheet**

Job # : <u>8241 6088</u>	Operator : <u>AP/km</u>	Stack Diameter (inches) : <u>23.5</u>
Facility : <u>outlet</u>	Site : <u>outlet</u>	Upstream Disturbance (inches) : _____
Date : <u>7/15/16</u>	Points : 1 <u>4.8</u> 5 <u>19.9</u> 9 _____	Downstream Disturbance (inches) : _____
Probe ID : <u>P-882</u>	2 <u>6.5</u> 6 <u>22.9</u> 10 _____	Schematic of Sampling Location : _____
Pitot Constant : <u>0.837</u>	3 <u>8.6</u> 7 <u>25</u> 11 _____	
	4 <u>11.6</u> 8 <u>26.7</u> 12 _____	

Run # : <u>1</u>	Run # : <u>3</u>	Run # : _____
O2% : _____	O2% : _____	O2% : _____
H2O% : _____	H2O% : _____	H2O% : _____
Ps ("H2O) : <u>-0.25</u>	Ps ("H2O) : <u>-0.25</u>	Ps ("H2O) : <u>960</u>
Start Time : <u>0900</u>	Start Time : <u>1105</u>	Start Time : <u>1115</u>
Stop Time : <u>0910</u>	Stop Time : <u>1105</u>	Stop Time : <u>1115</u>
Post Test Pitot Leak Check Good? : <u>0.0 @ 4.0" H2O</u>	Post Test Pitot Leak Check Good? : <u>0.0 @ 3.5"</u>	Post Test Pitot Leak Check Good? : <u>0.0 @ 3.5"</u>

Point #	Delta P	Ts	Notes	Point #	Delta P	Ts	Notes
1-1	0.28	160		1-1	0.27	174	
2	0.28	162		2	0.29	175	
3	0.28	162		3	0.29	176	
4	0.29	163		4	0.29	177	
5	0.29	163		5	0.30	177	
6	0.27	163		6	0.32	176	
7	0.27	164		7	0.32	176	
8	0.27	164		8	0.31	177	
2-1	0.29	163		2-1	0.29	175	
2	0.30	164		2	0.28	177	
3	0.29	164		3	0.30	177	
4	0.28	163		4	0.31	176	
5	0.28	163		5	0.33	176	
6	0.30	164		6	0.32	176	
7	0.28	164		7	0.34	177	
8	0.29	163		8	0.30	176	

Averages : <u>0.5326</u> <u>163.1</u>	Averages : <u>0.5603</u> <u>176.1</u>	Averages : <u>0.5515</u> <u>176.1</u>
Reviewers Signature : _____		

## **GC Chromatograms**

Client Information	
Client	BD Medical
Name of Plant	
City and State	Columbus, Nebraska
Testing Location (Unit ID)	Catalytic Oxidizer DRE Inlet / Outlet
Date	7/15/2016

Operator:	JCH	
GC:	Hugo	
Column	RTX-wax	Dual
Loop	25 uL	Det B
Loop	1 CC	Det A

Flows	DET A	DET B
CHP	10.1	
HE	20.3	30
H2	37	36.4
Air	415	418

Both sample lines heated to 257  
Pumps and Filiteres Heated to 290  
Both sample lines to GC heated to 250

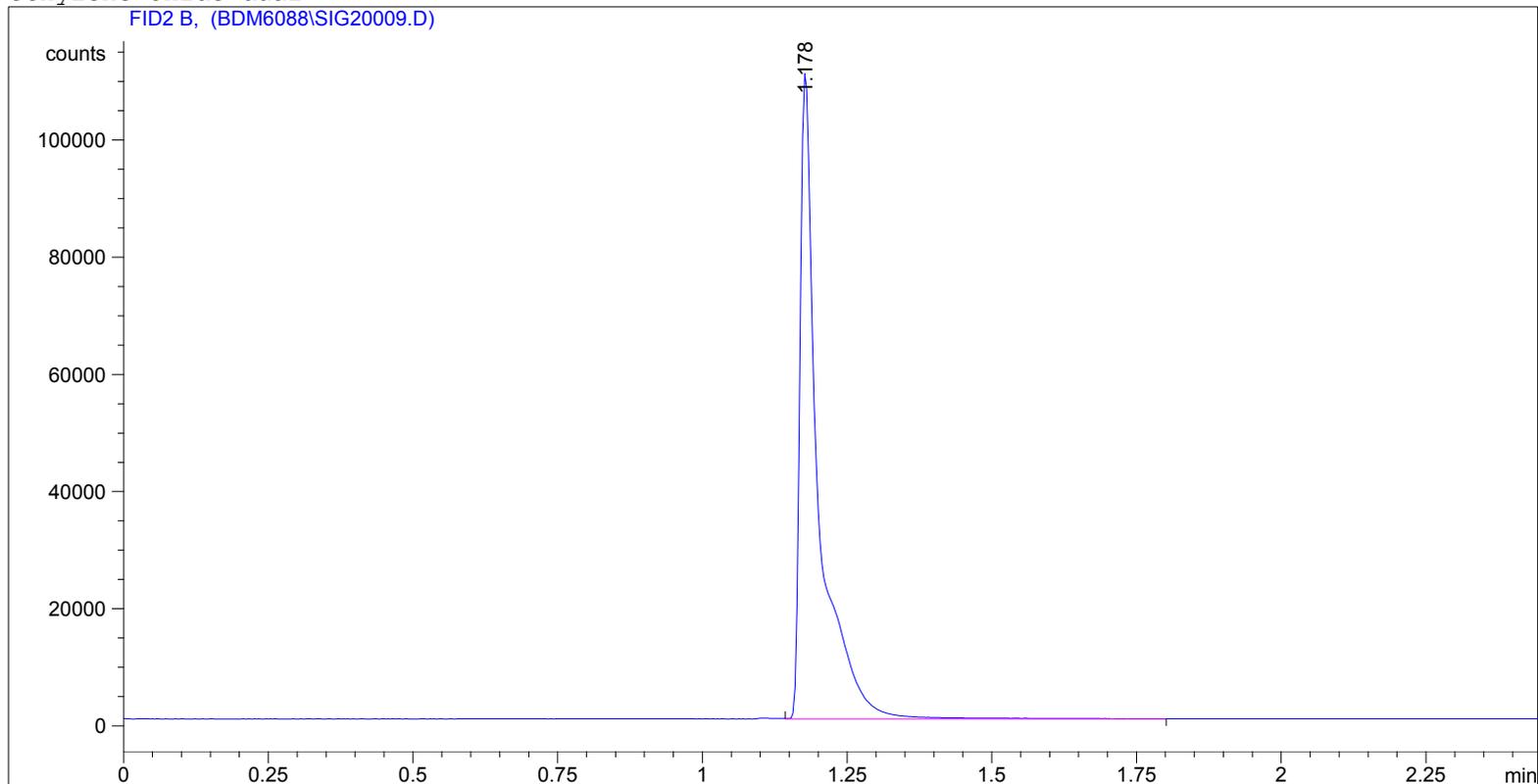
Signal DET A OUTLET	Description	Signal DET B INLET	Description	Notes
10009	Pre-Cal 51.5ppm	20009	Pre-Cal 5210ppm	7/14/2016
10010	Pre-Cal 51.5ppm	20010	Pre-Cal 5210ppm	
10011	Pre-Cal 51.5ppm	20011	Pre-Cal 5210ppm	
10012	Pre-Cal 25.75ppm	20012	Pre-Cal 2605ppm	
10013	Pre-Cal 25.75ppm	20013	Pre-Cal 2605ppm	
10014	Pre-Cal 25.75ppm	20014	Pre-Cal 2605ppm	
10015	Pre-Cal 12.8ppm	20015	Pre-Cal 1302.5ppm	Leak Checked checked through manifold and through heated head pumps, both pre pump and post.
10016	Pre-Cal 12.8ppm	20016	Pre-Cal 1302.5ppm	
10017	Pre-Cal 12.8ppm	20017	Pre-Cal 1302.5ppm	
10018	Line Loss 51.5ppm	20018	Line Loss 5210ppm	
10019	Line Loss 51.5ppm	20019	Line Loss 5210ppm	To get correct injection: Turn on pump, open valves from sample line, open valves on pump, turn off pump, close valves on sample line, close valves on pump. Wait for line to depressurize.
10020	Line Loss 51.5ppm	20020	Line Loss 5210ppm	
10021	Diagnostic Run 1, Inj 1	20021	Diagnostic Run 1, Inj 1	7/15/2016
10022	Diagnostic Run 1, Inj 2	20022	Diagnostic Run 1, Inj 2	
10023	Diagnostic Run 1, Inj 3	20023	Diagnostic Run 1, Inj 3	
10024	Diagnostic Run 1, Inj 4	20024	Diagnostic Run 1, Inj 4	
10027	Run 1, Inj 1	20027	Run 1, Inj 1	
10028	Run 1, Inj 2	20028	Run 1, Inj 2	
10029	Run 1, Inj 3	20029	Run 1, Inj 3	
10030	Run 1, Inj 4	20030	Run 1, Inj 4	
10031	Run 1, Inj 5	20031	Run 1, Inj 5	
10032	Run 2, Inj 1	20032	Run 2, Inj 1	
10033	Run 2, Inj 2	20033	Run 2, Inj 2	
10034	Run 2, Inj 3	20034	Run 2, Inj 3	
10035	Run 2, Inj 4	20035	Run 2, Inj 4	
10036	Run 2, Inj 5	20036	Run 2, Inj 5	
10037	Run 3, Inj 1	20037	Run 3, Inj 1	
10038	Run 3, Inj 2	20038	Run 3, Inj 2	
10039	Run 3, Inj 3	20039	Run 3, Inj 3	
10040	Run 3, Inj 4	20040	Run 3, Inj 4	
10041	Run 3, Inj 5	20041	Run 3, Inj 5	
10042	Post Cal 25.75ppm	20043	Post Cal 2605ppm	
10043	Post Cal 25.75ppm	20044	Post Cal 2605ppm	
10044	Post Cal 25.75ppm	20045	Post Cal 2605ppm	

Reminders
Moisture number from the outlet will also be used as the moisture for the Inlet.
Emmision rates are reported in lb/hr, NOT in ppms
Minimum Detection Limit is .18. Anything below is reported as .18.

**Inlet Pre-Cal**

EO Pre-Cal 5210ppm

```
=====
Injection Date   : 7/14/2016 12:27:55 PM
Sample Name     : Pre-Cal 5210                Location  : Vial 2
Acq. Operator   : JCH
Acq. Instrument : Instrument 1                Inj Volume: External
Method          : C:\HPCHEM\1\METHODS\ETHYDUAL.M
Last changed    : 7/2/2015 1:34:02 PM by JCH
ethylene oxide dual
```



```
=====
                          Area Percent Report
=====
```

```
Sorted By           :      Signal
Multiplier          :      1.0000
Dilution            :      1.0000
Use Multiplier & Dilution Factor with ISTDs
```

Signal 1: FID2 B,

Peak #	RetTime [min]	Type	Width [min]	Area counts*s	Height [counts]	Area %
1	1.178	VV	0.0319	2.46335e5	1.11055e5	1.000e2

```
Totals :                2.46335e5  1.11055e5
```

Results obtained with enhanced integrator!

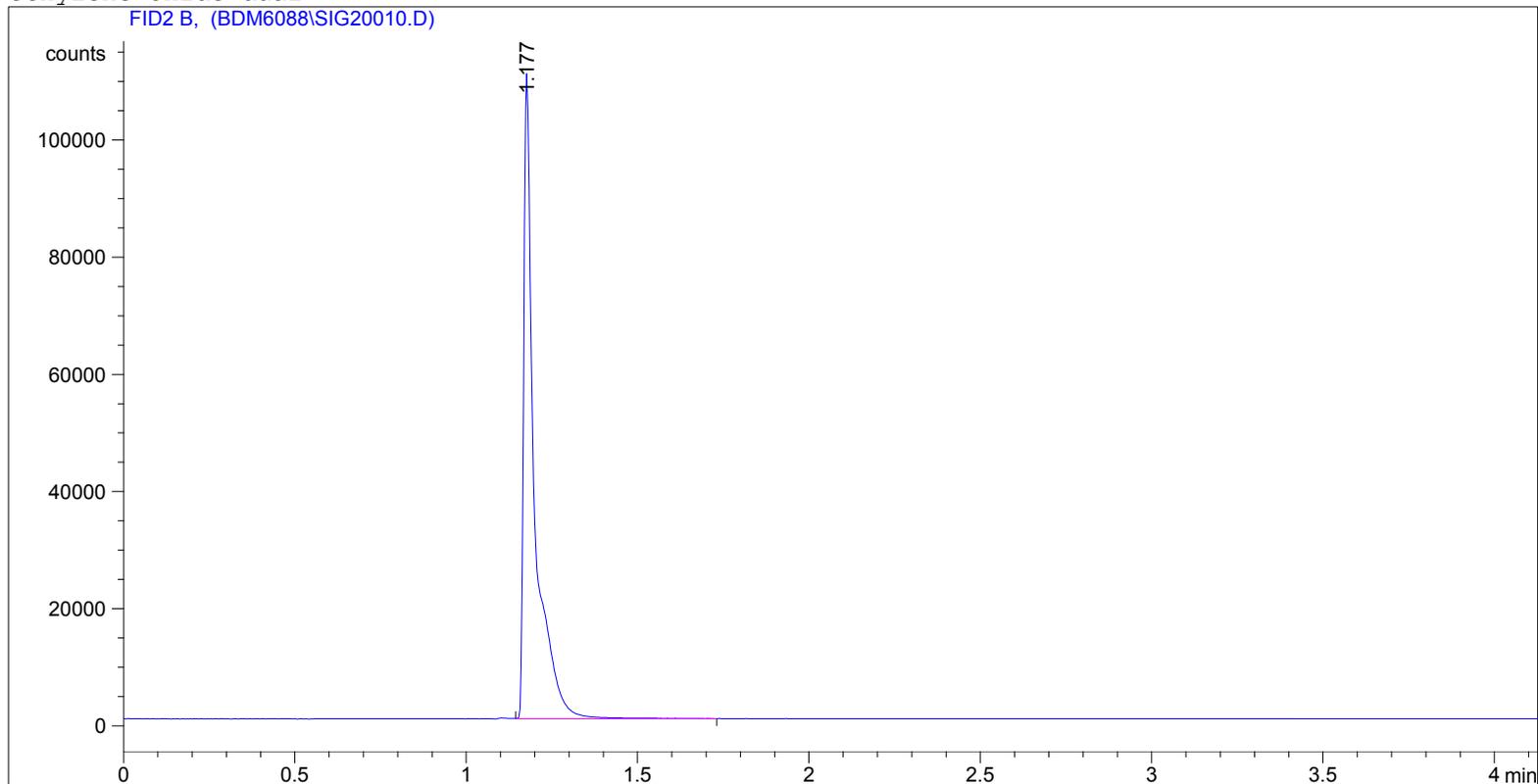
```
=====
*** End of Report ***
```

EO Pre-Cal 5210ppm

```

=====
Injection Date   : 7/14/2016 12:30:46 PM
Sample Name     : Pre-Cal 5210                Location  : Vial 2
Acq. Operator   : JCH
Acq. Instrument : Instrument 1                Inj Volume: External
Method          : C:\HPCHEM\1\METHODS\ETHYDUAL.M
Last changed    : 7/2/2015 1:34:02 PM by JCH
ethylene oxide dual

```



```

=====
                          Area Percent Report
=====

```

```

Sorted By           :      Signal
Multiplier          :      1.0000
Dilution            :      1.0000
Use Multiplier & Dilution Factor with ISTDs

```

Signal 1: FID2 B,

Peak #	RetTime [min]	Type	Width [min]	Area counts*s	Height [counts]	Area %
1	1.177	VV	0.0308	2.43749e5	1.10154e5	1.000e2

```
Totals :                2.43749e5  1.10154e5
```

Results obtained with enhanced integrator!

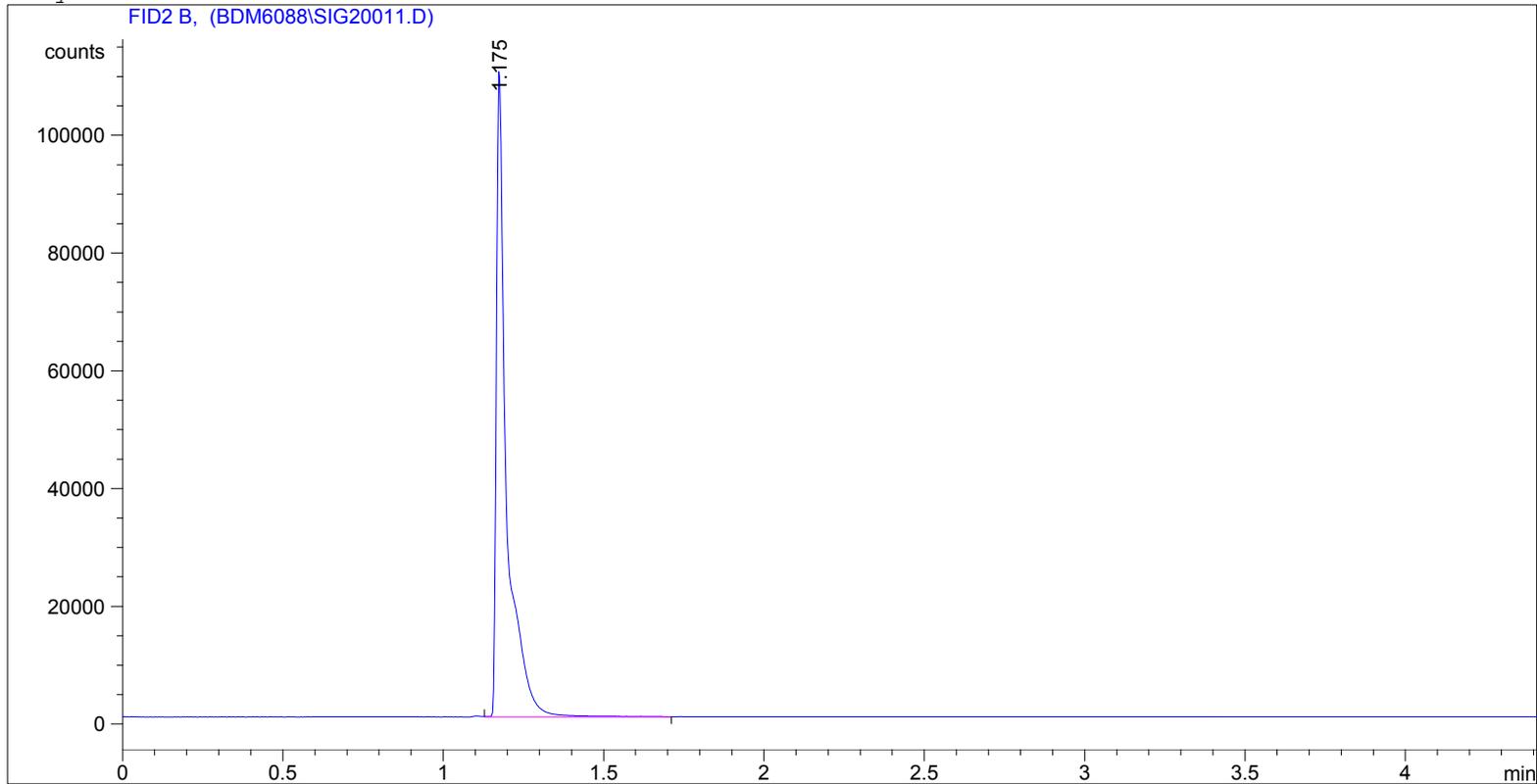
```

=====
*** End of Report ***

```

EO Pre-Cal 5210ppm

```
=====
Injection Date   : 7/14/2016 12:35:23 PM
Sample Name     : Pre-Cal 5210                Location  : Vial 2
Acq. Operator   : JCH
Acq. Instrument : Instrument 1                Inj Volume: External
Method          : C:\HPCHEM\1\METHODS\ETHYDUAL.M
Last changed    : 7/2/2015 1:34:02 PM by JCH
ethylene oxide dual
```



```
=====
                          Area Percent Report
=====
```

```
Sorted By           :      Signal
Multiplier          :      1.0000
Dilution            :      1.0000
Use Multiplier & Dilution Factor with ISTDs
```

Signal 1: FID2 B,

Peak #	RetTime [min]	Type	Width [min]	Area counts*s	Height [counts]	Area %
1	1.175	VV	0.0317	2.45096e5	1.11052e5	1.000e2

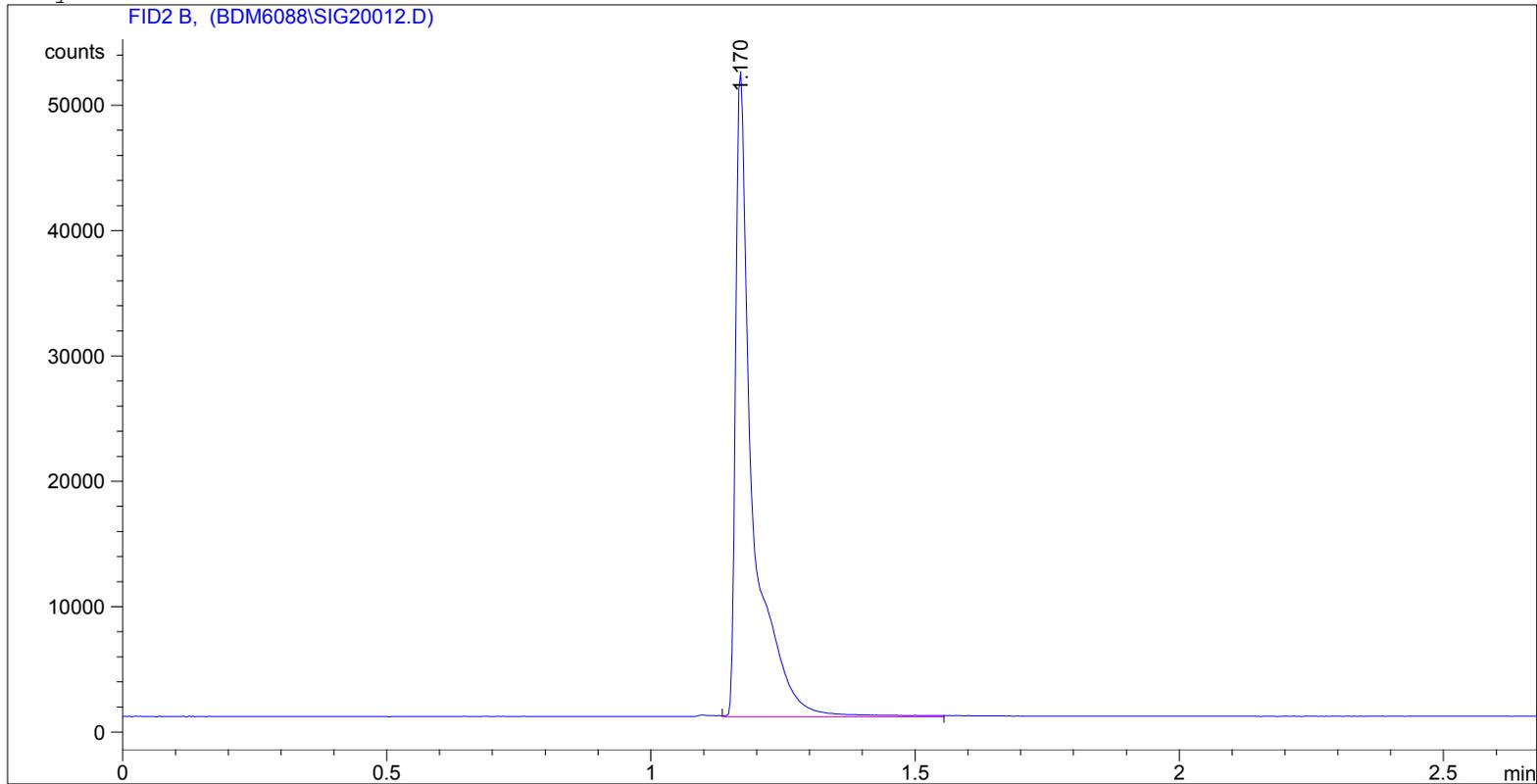
```
Totals :                2.45096e5  1.11052e5
```

Results obtained with enhanced integrator!

```
=====
*** End of Report ***
```

EO Inlet Pre-Cal 5210ppm

```
=====
Injection Date   : 7/14/2016 12:48:20 PM
Sample Name     : Pre-Cal 2605                Location  : Vial 2
Acq. Operator   : JCH
Acq. Instrument : Instrument 1                Inj Volume: External
Method          : C:\HPCHEM\1\METHODS\ETHYDUAL.M
Last changed    : 7/2/2015 1:34:02 PM by JCH
ethylene oxide dual
```



```
=====
                          Area Percent Report
=====
```

```
Sorted By           :      Signal
Multiplier          :      1.0000
Dilution            :      1.0000
Use Multiplier & Dilution Factor with ISTDs
```

Signal 1: FID2 B,

Peak #	RetTime [min]	Type	Width [min]	Area counts*s	Height [counts]	Area %
1	1.170	VV	0.0320	1.14924e5	5.15120e4	1.000e2

```
Totals :                1.14924e5  5.15120e4
```

Results obtained with enhanced integrator!

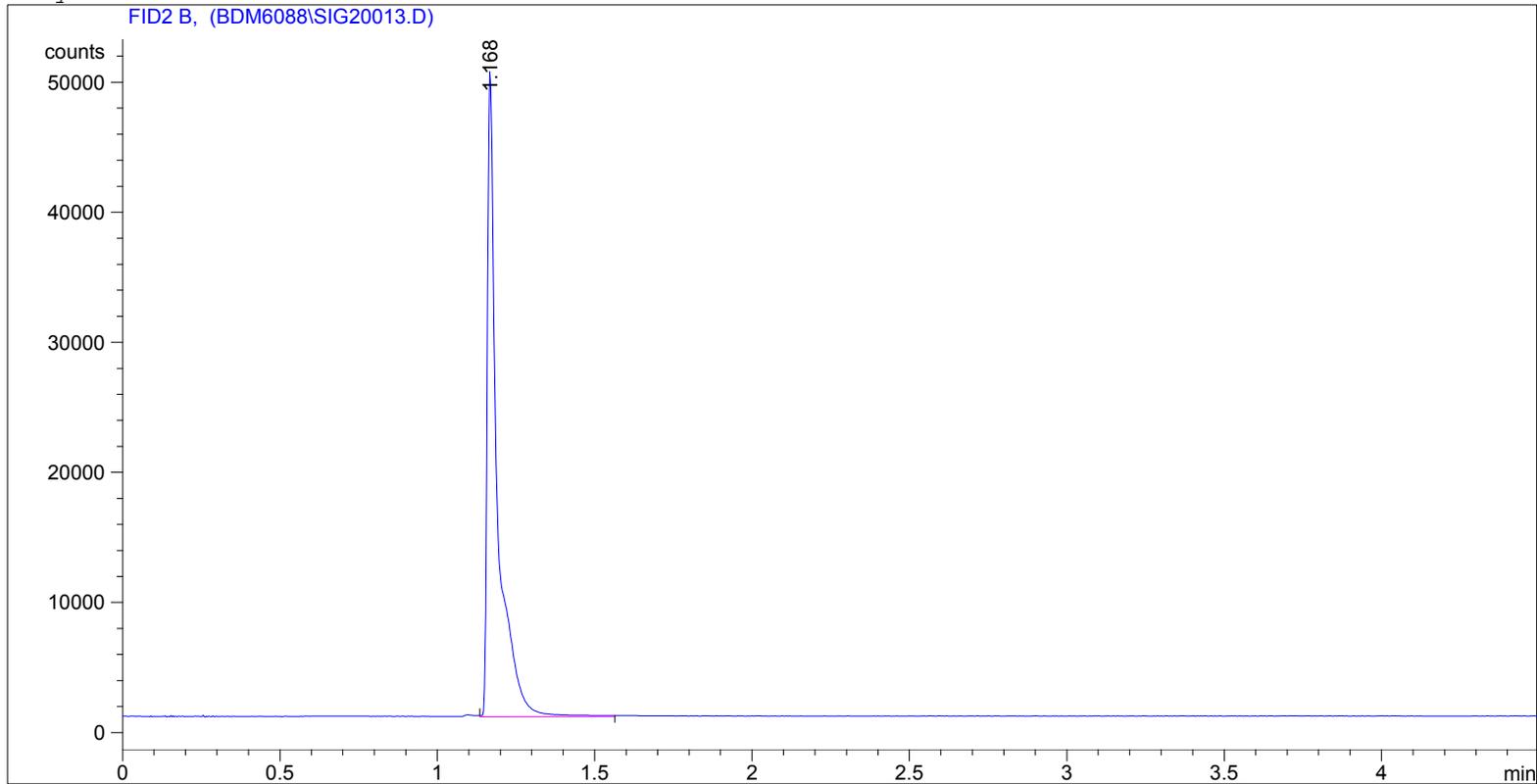
```
=====
*** End of Report ***
```

EO Inlet Pre-Cal 5210ppm

```

=====
Injection Date   : 7/14/2016 12:51:27 PM
Sample Name     : Pre-Cal 2605                Location  : Vial 2
Acq. Operator   : JCH
Acq. Instrument : Instrument 1              Inj Volume : External
Method          : C:\HPCHEM\1\METHODS\ETHYDUAL.M
Last changed    : 7/2/2015 1:34:02 PM by JCH
ethylene oxide dual

```



```

=====
                          Area Percent Report
=====

```

```

Sorted By           :      Signal
Multiplier          :      1.0000
Dilution            :      1.0000
Use Multiplier & Dilution Factor with ISTDs

```

Signal 1: FID2 B,

Peak #	RetTime [min]	Type	Width [min]	Area counts*s	Height [counts]	Area %
1	1.168	VV	0.0318	1.10556e5	5.00757e4	1.000e2

```
Totals :                1.10556e5  5.00757e4
```

Results obtained with enhanced integrator!

```

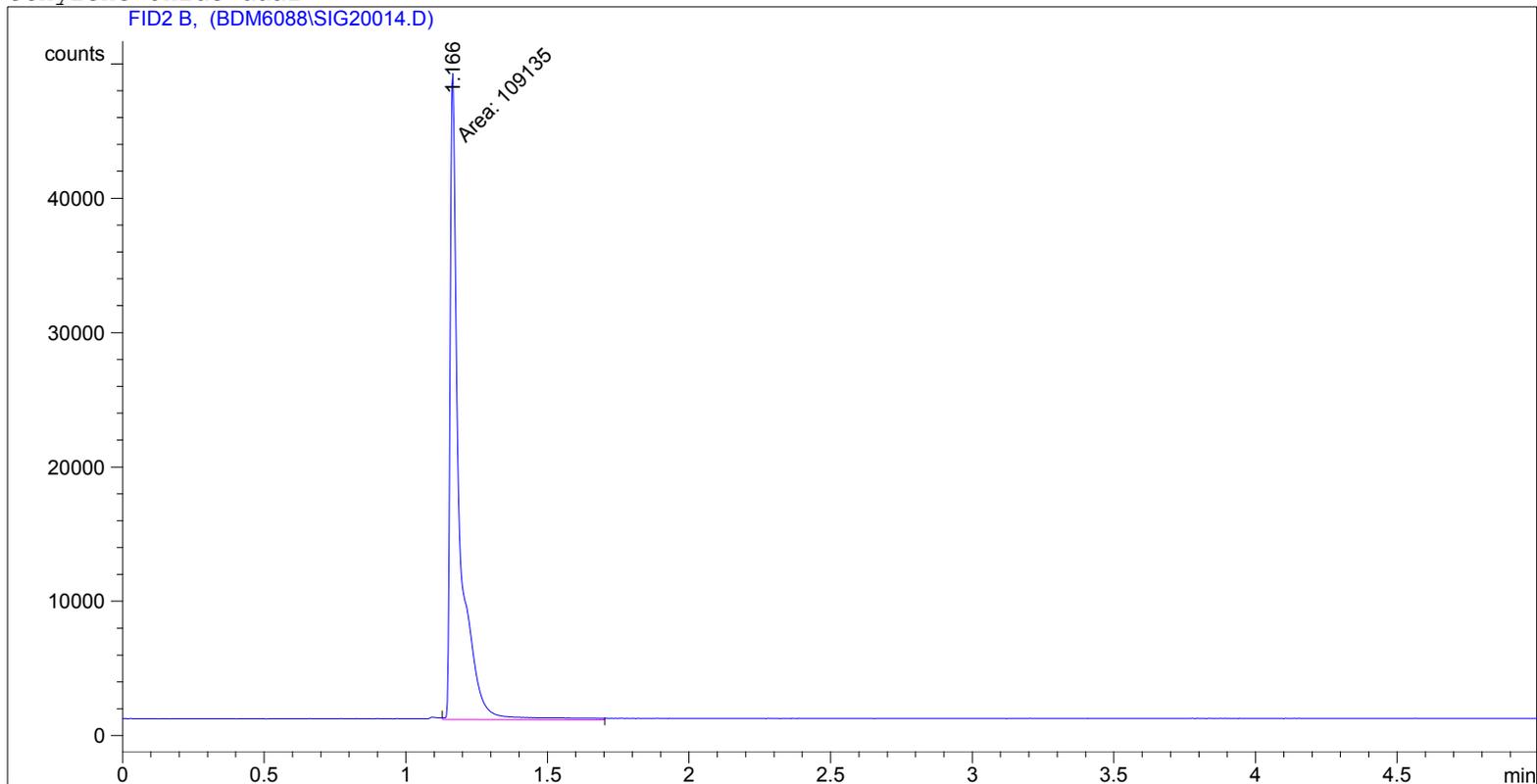
=====
*** End of Report ***

```

EO Inlet Pre-Cal 5210ppm

```

=====
Injection Date   : 7/14/2016 12:56:14 PM
Sample Name     : Pre-Cal 2605                Location  : Vial 2
Acq. Operator   : JCH
Acq. Instrument : Instrument 1                Inj Volume: External
Method          : C:\HPCHEM\1\METHODS\ETHYDUAL.M
Last changed    : 7/2/2015 1:34:02 PM by JCH
ethylene oxide dual
  
```



```

=====
                          Area Percent Report
=====
  
```

```

Sorted By           :      Signal
Multiplier          :      1.0000
Dilution            :      1.0000
Use Multiplier & Dilution Factor with ISTDs
  
```

Signal 1: FID2 B,

Peak #	RetTime [min]	Type	Width [min]	Area counts*s	Height [counts]	Area %
1	1.166	MM	0.0375	1.09135e5	4.85148e4	1.000e2

```
Totals :                1.09135e5  4.85148e4
```

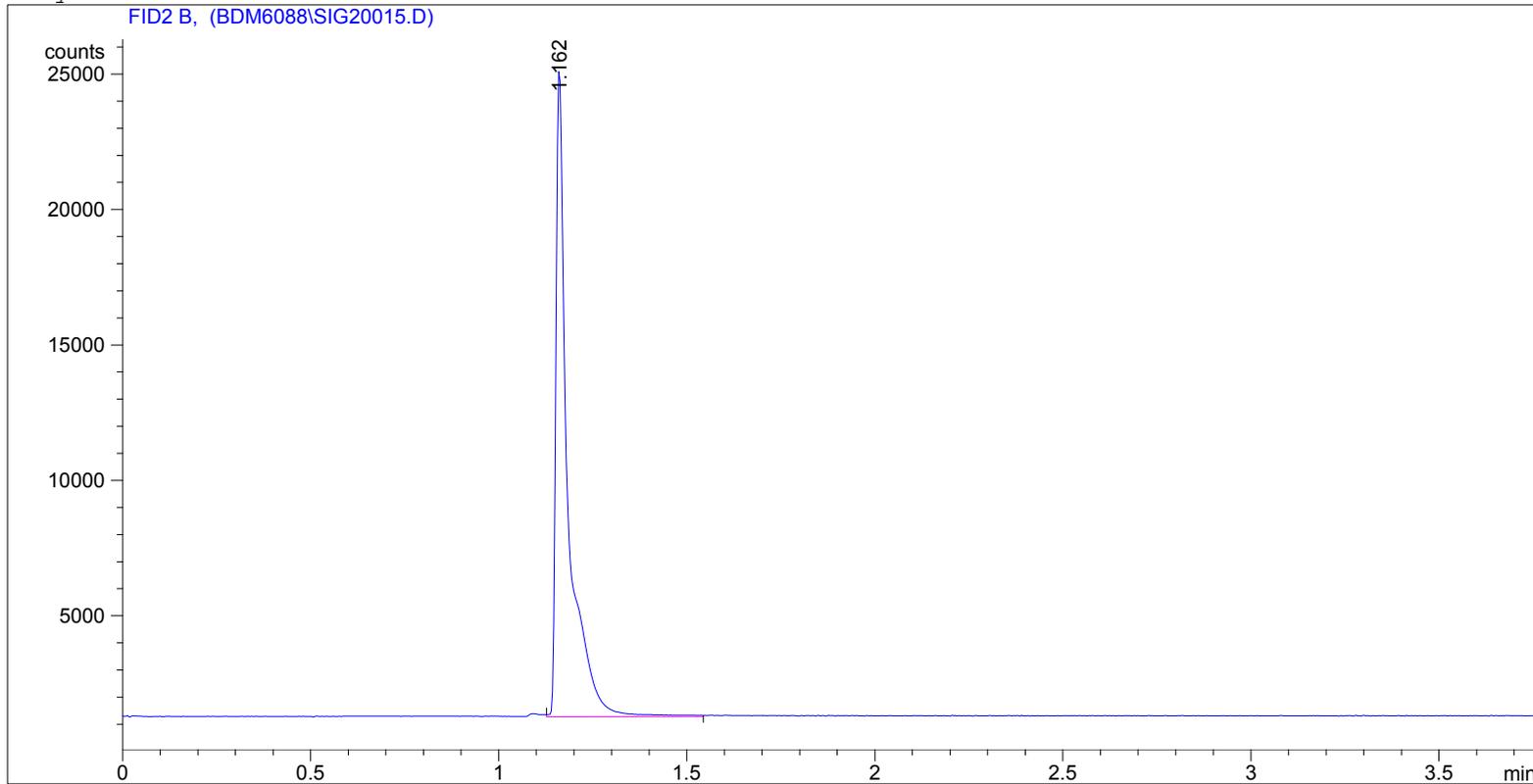
Results obtained with enhanced integrator!

```

=====
*** End of Report ***
  
```

EO Inlet Pre-Cal 1302.5ppm

```
=====
Injection Date   : 7/14/2016 1:05:14 PM
Sample Name      : Pre-Cal 1302.5           Location  : Vial 2
Acq. Operator    : JCH
Acq. Instrument  : Instrument 1           Inj Volume : External
Method           : C:\HPCHEM\1\METHODS\ETHYDUAL.M
Last changed     : 7/2/2015 1:34:02 PM by JCH
ethylene oxide dual
```



```
=====
Area Percent Report
=====
```

```
Sorted By          :      Signal
Multiplier         :      1.0000
Dilution           :      1.0000
Use Multiplier & Dilution Factor with ISTDs
```

Signal 1: FID2 B,

Peak #	RetTime [min]	Type	Width [min]	Area counts*s	Height [counts]	Area %
1	1.162	VV	0.0317	5.30669e4	2.41203e4	1.000e2

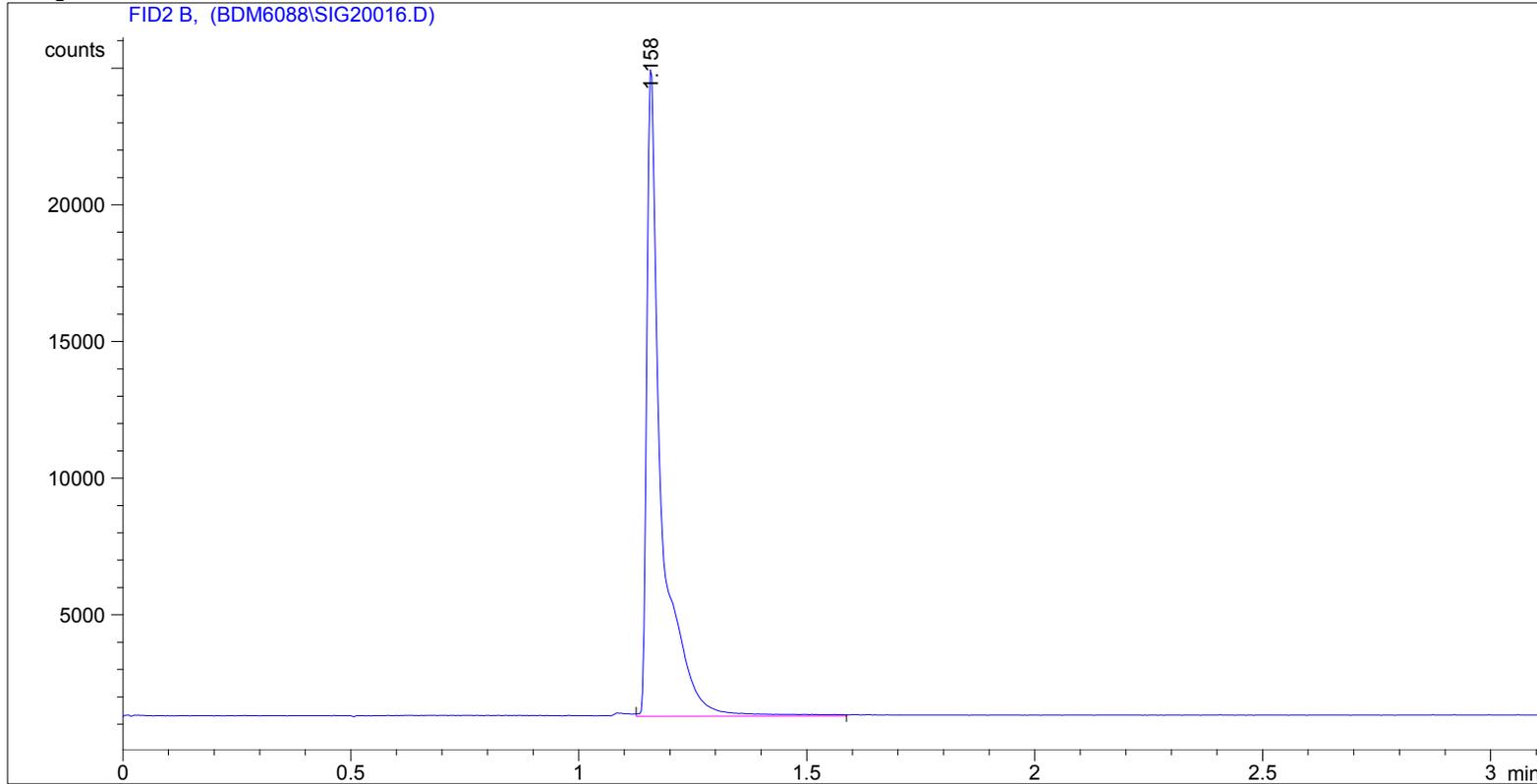
```
Totals :                5.30669e4  2.41203e4
```

Results obtained with enhanced integrator!

```
=====
*** End of Report ***
```

EO Inlet Pre-Cal 1302.5ppm

```
=====
Injection Date   : 7/14/2016 1:12:58 PM
Sample Name     : Pre-Cal 1302.5           Location  : Vial 2
Acq. Operator   : JCH
Acq. Instrument : Instrument 1           Inj Volume: External
Method          : C:\HPCHEM\1\METHODS\ETHYDUAL.M
Last changed    : 7/2/2015 1:34:02 PM by JCH
ethylene oxide dual
```



```
=====
                          Area Percent Report
=====
```

```
Sorted By           :      Signal
Multiplier          :      1.0000
Dilution            :      1.0000
Use Multiplier & Dilution Factor with ISTDs
```

Signal 1: FID2 B,

Peak #	RetTime [min]	Type	Width [min]	Area counts*s	Height [counts]	Area %
1	1.158	VV	0.0320	5.27671e4	2.36540e4	1.000e2

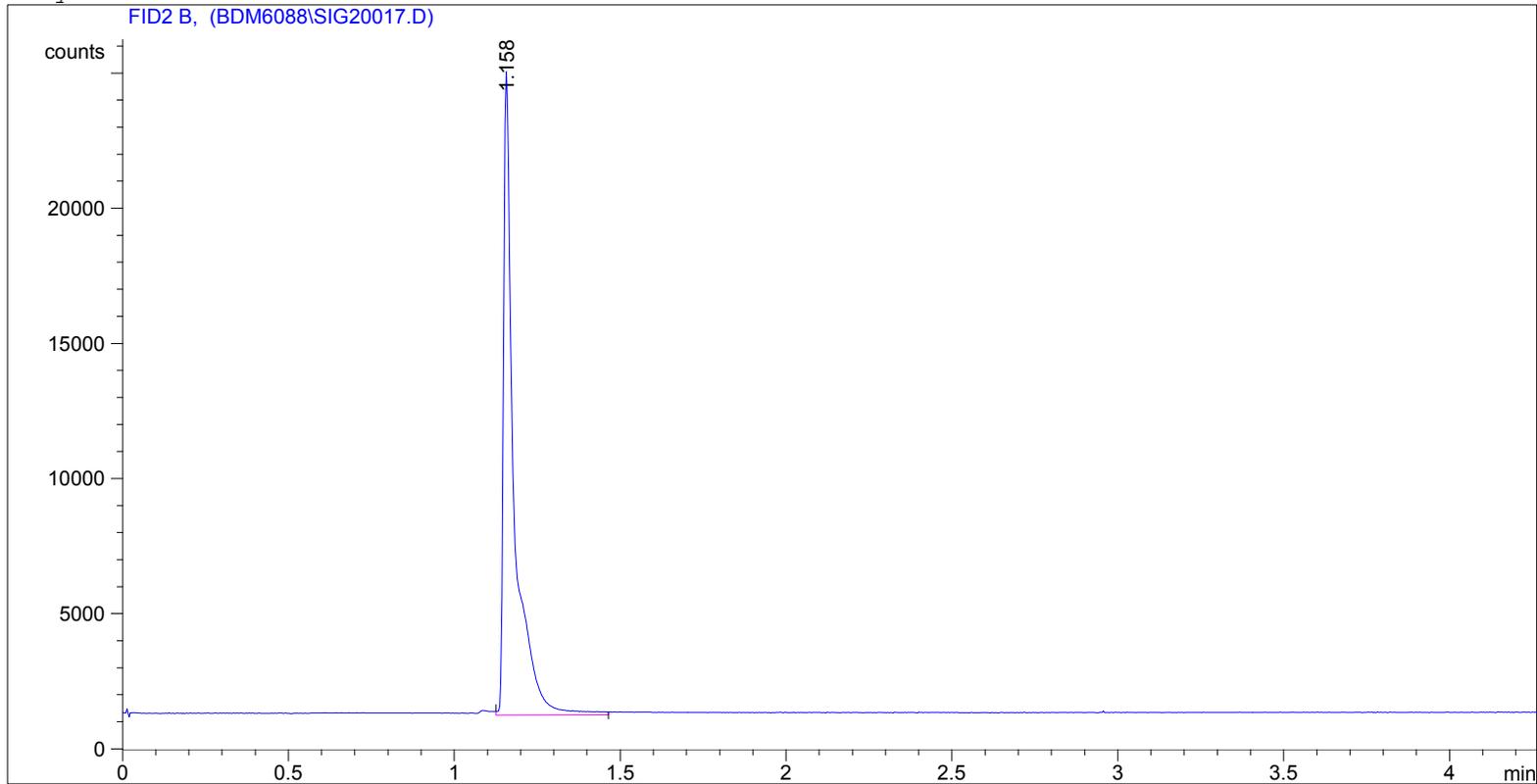
```
Totals :                5.27671e4  2.36540e4
```

Results obtained with enhanced integrator!

```
=====
*** End of Report ***
```

EO Inlet Pre-Cal 1302.5ppm

```
=====
Injection Date   : 7/14/2016 1:16:33 PM
Sample Name     : Pre-Cal 1302.5           Location  : Vial 2
Acq. Operator  : JCH
Acq. Instrument : Instrument 1           Inj Volume : External
Method         : C:\HPCHEM\1\METHODS\ETHYDUAL.M
Last changed   : 7/2/2015 1:34:02 PM by JCH
ethylene oxide dual
```



```
=====
                          Area Percent Report
=====
```

```
Sorted By           :      Signal
Multiplier          :      1.0000
Dilution            :      1.0000
Use Multiplier & Dilution Factor with ISTDs
```

Signal 1: FID2 B,

Peak #	RetTime [min]	Type	Width [min]	Area counts*s	Height [counts]	Area %
1	1.158	VV	0.0310	5.32999e4	2.38990e4	1.000e2

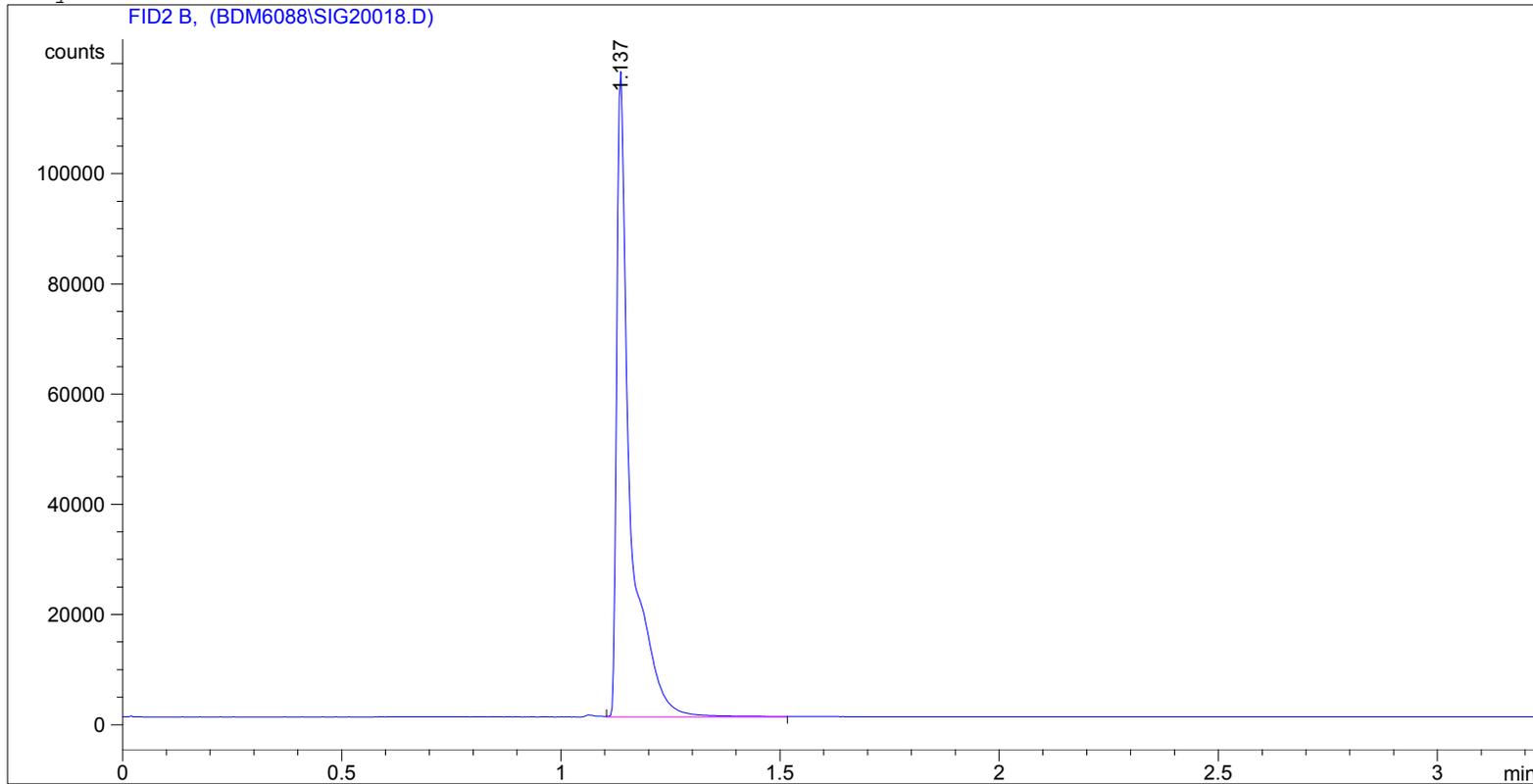
```
Totals :                5.32999e4  2.38990e4
```

Results obtained with enhanced integrator!

```
=====
*** End of Report ***
```

EO Inlet Line Loss 5210ppm

```
=====
Injection Date   : 7/14/2016 1:48:06 PM
Sample Name     : Line Loss 5210           Location  : Vial 2
Acq. Operator   : JCH
Acq. Instrument : Instrument 1             Inj Volume: External
Method          : C:\HPCHEM\1\METHODS\ETHYDUAL.M
Last changed    : 7/2/2015 1:34:02 PM by JCH
ethylene oxide dual
```



```
=====
                          Area Percent Report
=====
```

```
Sorted By           :      Signal
Multiplier          :      1.0000
Dilution           :      1.0000
Use Multiplier & Dilution Factor with ISTDs
```

Signal 1: FID2 B,

Peak #	RetTime [min]	Type	Width [min]	Area counts*s	Height [counts]	Area %
1	1.137	VV	0.0300	2.51461e5	1.17135e5	1.000e2

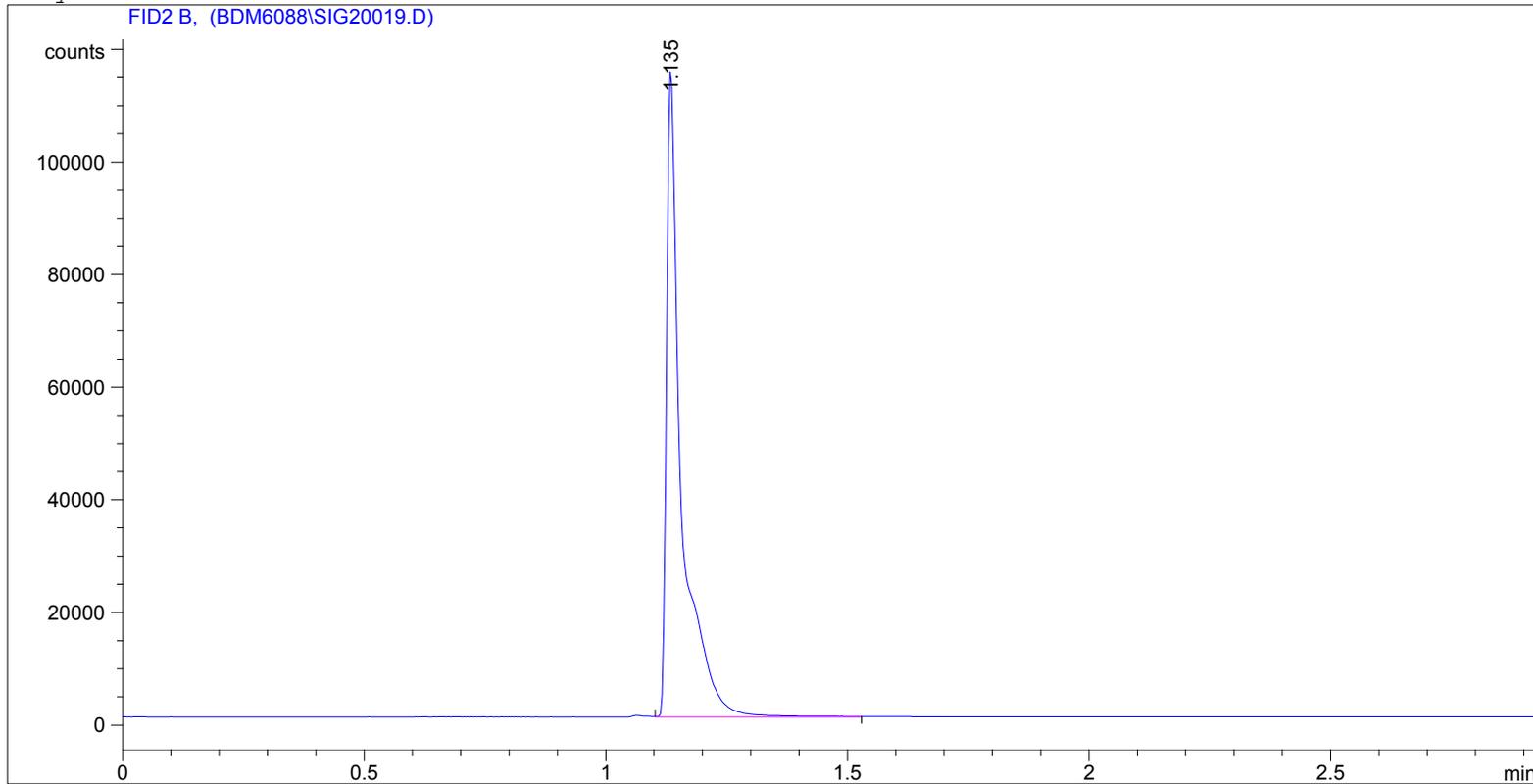
```
Totals :                2.51461e5  1.17135e5
```

Results obtained with enhanced integrator!

```
=====
*** End of Report ***
```

EO Inlet Line Loss 5210ppm

```
=====
Injection Date   : 7/14/2016 1:55:41 PM
Sample Name     : Line Loss 5210           Location  : Vial 2
Acq. Operator  : JCH
Acq. Instrument : Instrument 1             Inj Volume: External
Method         : C:\HPCHEM\1\METHODS\ETHYDUAL.M
Last changed   : 7/2/2015 1:34:02 PM by JCH
ethylene oxide dual
```



```
=====
                          Area Percent Report
=====
```

```
Sorted By           :      Signal
Multiplier          :      1.0000
Dilution            :      1.0000
Use Multiplier & Dilution Factor with ISTDs
```

Signal 1: FID2 B,

Peak #	RetTime [min]	Type	Width [min]	Area counts*s	Height [counts]	Area %
1	1.135	VV	0.0309	2.47674e5	1.15943e5	1.000e2

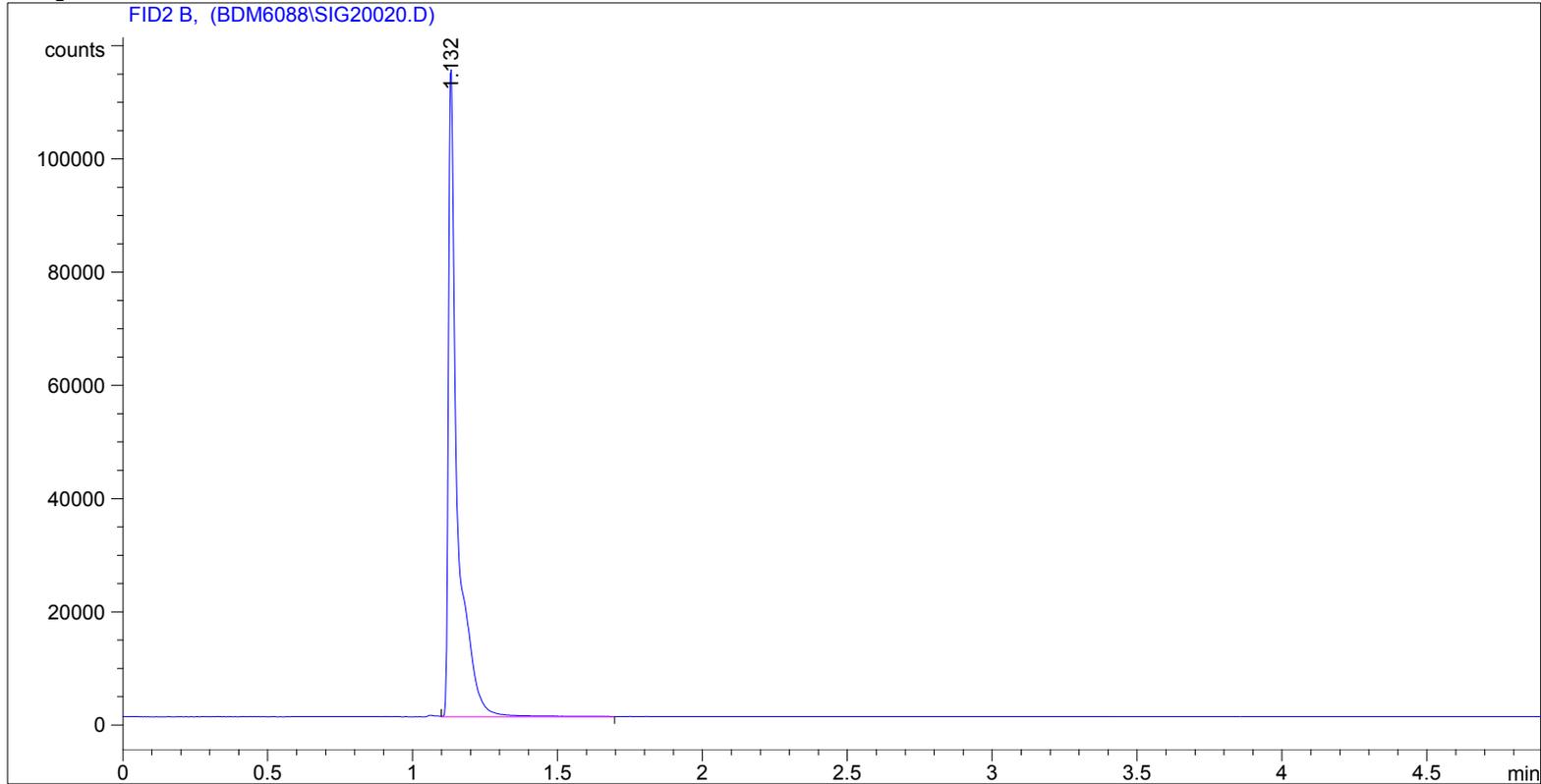
```
Totals :                2.47674e5  1.15943e5
```

Results obtained with enhanced integrator!

```
=====
*** End of Report ***
```

EO Inlet Line Loss 5210ppm

```
=====
Injection Date   : 7/14/2016 1:59:17 PM
Sample Name      : Line Loss 5210           Location  : Vial 2
Acq. Operator    : JCH
Acq. Instrument  : Instrument 1           Inj Volume: External
Method           : C:\HPCHEM\1\METHODS\ETHYDUAL.M
Last changed     : 7/2/2015 1:34:02 PM by JCH
ethylene oxide dual
```



```
=====
                          Area Percent Report
=====
```

```
Sorted By           :      Signal
Multiplier          :      1.0000
Dilution            :      1.0000
Use Multiplier & Dilution Factor with ISTDs
```

Signal 1: FID2 B,

Peak #	RetTime [min]	Type	Width [min]	Area counts*s	Height [counts]	Area %
1	1.132	VV	0.0312	2.48526e5	1.14925e5	1.000e2

```
Totals :                2.48526e5  1.14925e5
```

Results obtained with enhanced integrator!

```
=====
*** End of Report ***
```

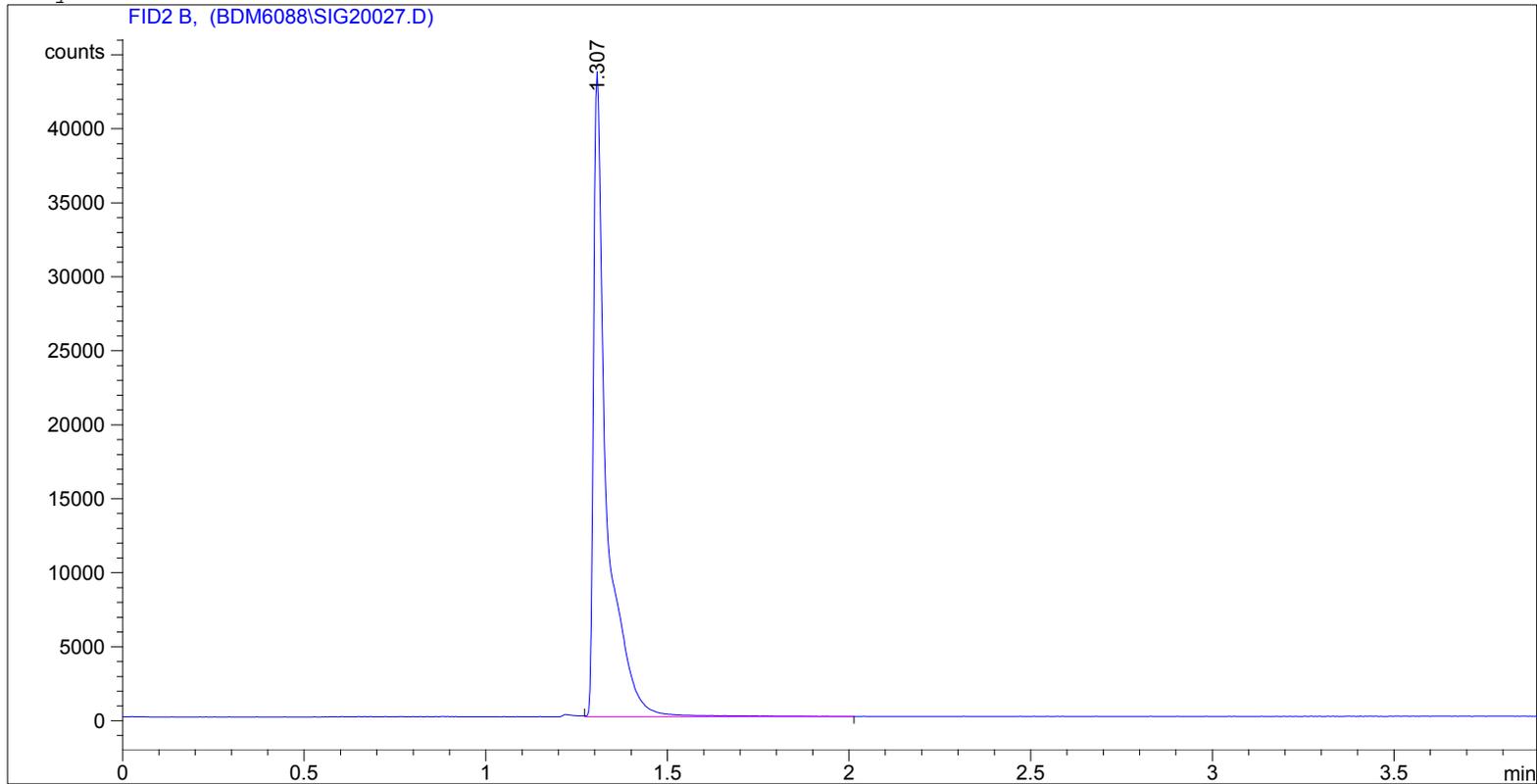
## **Inlet Runs**

EO Inlet Run 1, Inj 1

```

=====
Injection Date   : 7/15/2016 8:48:22 AM
Sample Name     : Inlet Run 1                Location  : Vial 2
Acq. Operator   : JCH
Acq. Instrument : Instrument 1              Inj Volume: External
Method          : C:\HPCHEM\1\METHODS\ETHYDUAL.M
Last changed    : 7/2/2015 1:34:02 PM by JCH
ethylene oxide dual

```



```

=====
                          Area Percent Report
=====

```

```

Sorted By           :      Signal
Multiplier          :      1.0000
Dilution            :      1.0000
Use Multiplier & Dilution Factor with ISTDs

```

Signal 1: FID2 B,

Peak #	RetTime [min]	Type	Width [min]	Area counts*s	Height [counts]	Area %
1	1.307	VP	0.0350	1.08521e5	4.35959e4	1.000e2

```
Totals :                1.08521e5  4.35959e4
```

Results obtained with enhanced integrator!

```

=====
*** End of Report ***

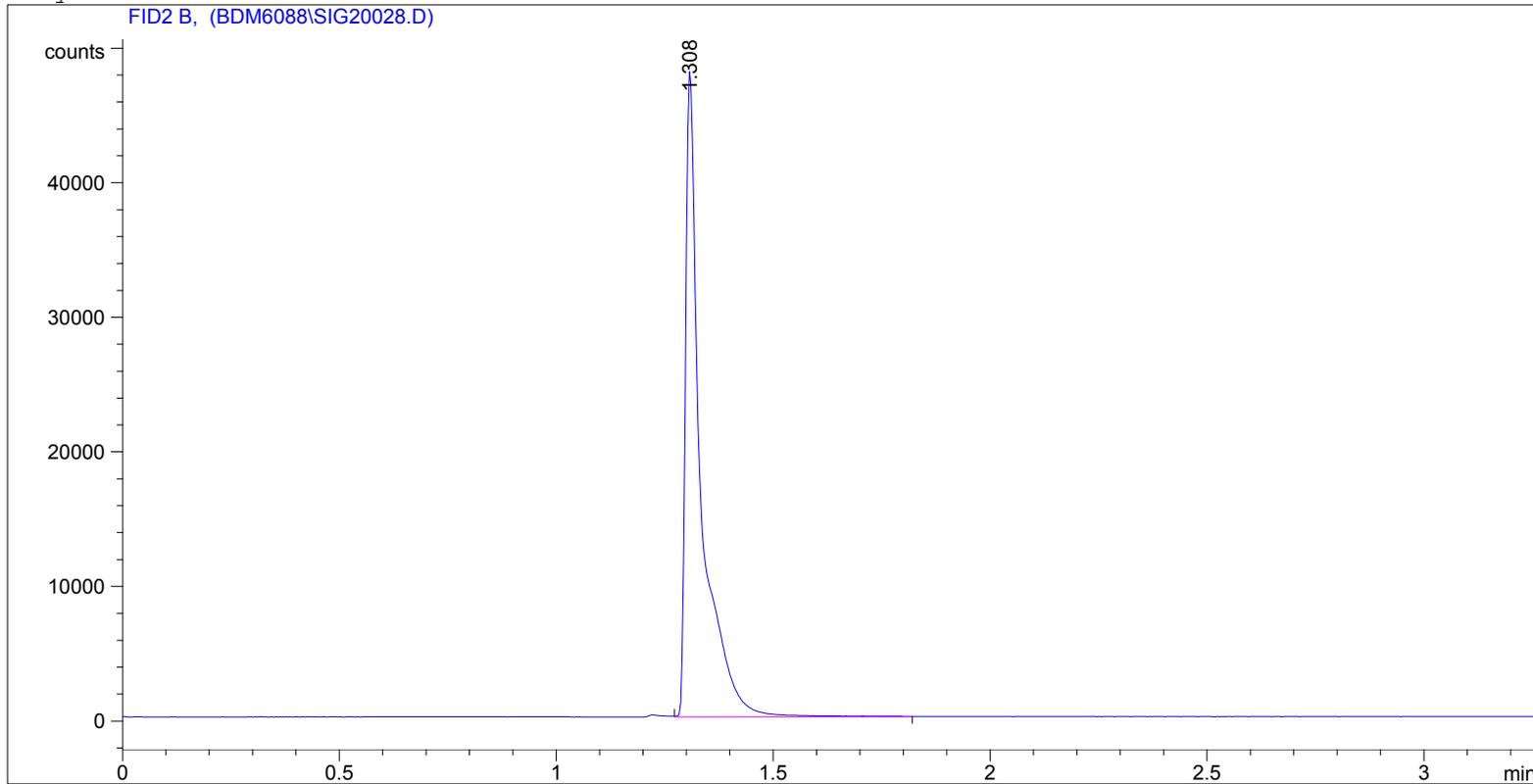
```

EO Inlet Run 1, Inj 2

```

=====
Injection Date   : 7/15/2016 8:57:23 AM
Sample Name     : Inlet Run 1                Location  : Vial 2
Acq. Operator   : JCH
Acq. Instrument : Instrument 1              Inj Volume: External
Method          : C:\HPCHEM\1\METHODS\ETHYDUAL.M
Last changed    : 7/2/2015 1:34:02 PM by JCH
ethylene oxide dual

```



```

=====
                          Area Percent Report
=====

```

```

Sorted By           :      Signal
Multiplier          :      1.0000
Dilution            :      1.0000
Use Multiplier & Dilution Factor with ISTDs

```

Signal 1: FID2 B,

Peak #	RetTime [min]	Type	Width [min]	Area counts*s	Height [counts]	Area %
1	1.308	VV	0.0349	1.19832e5	4.83370e4	1.000e2

```
Totals :                1.19832e5  4.83370e4
```

Results obtained with enhanced integrator!

```

=====
*** End of Report ***

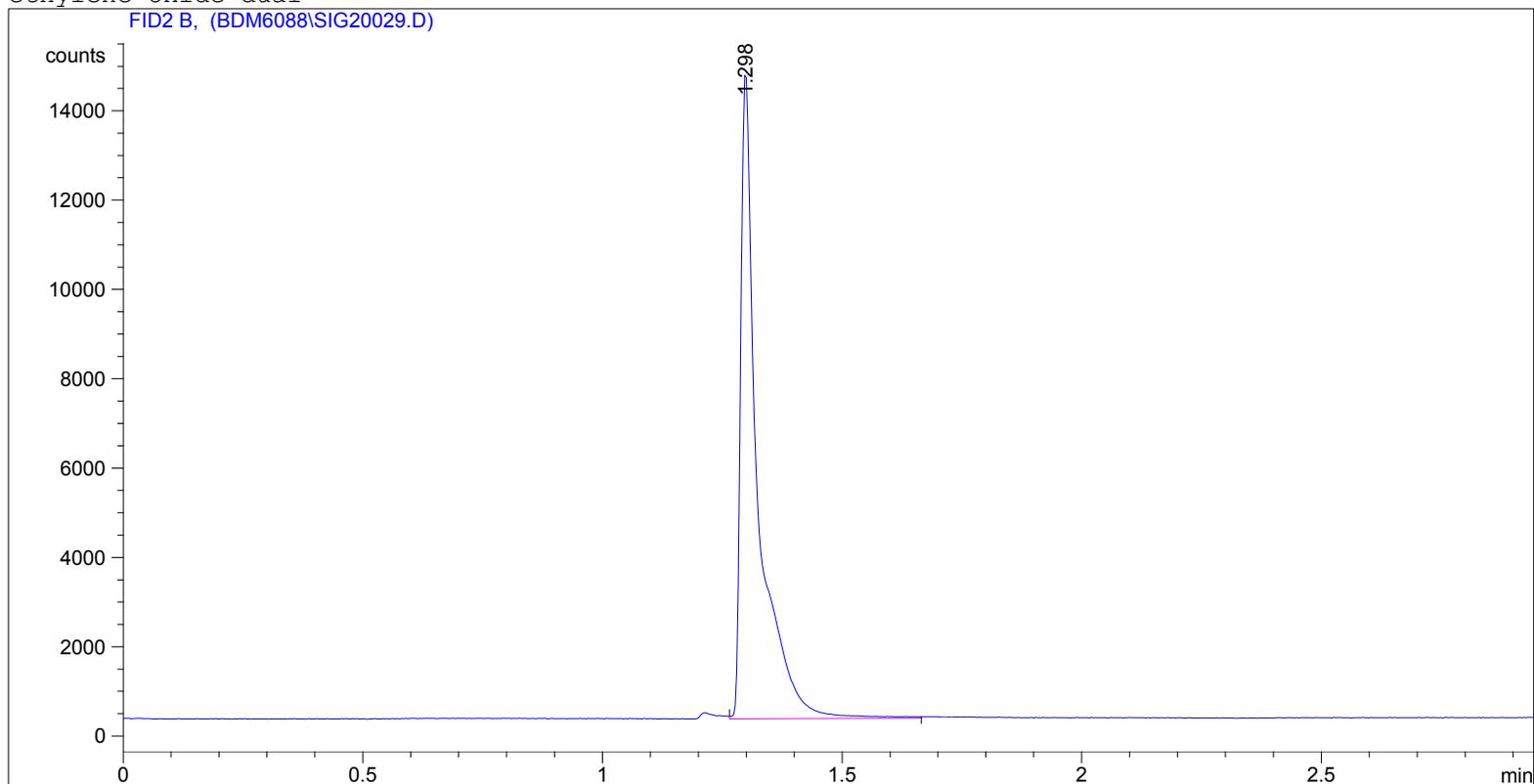
```

EO Inlet Run 1, Inj 3

```

=====
Injection Date   : 7/15/2016 9:14:17 AM
Sample Name     : Inlet Run 1                Location  : Vial 2
Acq. Operator   : JCH
Acq. Instrument : Instrument 1              Inj Volume: External
Method          : C:\HPCHEM\1\METHODS\ETHYDUAL.M
Last changed    : 7/2/2015 1:34:02 PM by JCH
ethylene oxide dual

```



```

=====
                          Area Percent Report
=====

```

```

Sorted By           :      Signal
Multiplier          :      1.0000
Dilution            :      1.0000
Use Multiplier & Dilution Factor with ISTDs

```

Signal 1: FID2 B,

Peak #	RetTime [min]	Type	Width [min]	Area counts*s	Height [counts]	Area %
1	1.298	VV	0.0351	3.60817e4	1.44663e4	1.000e2

```
Totals :                3.60817e4  1.44663e4
```

Results obtained with enhanced integrator!

```

=====
*** End of Report ***

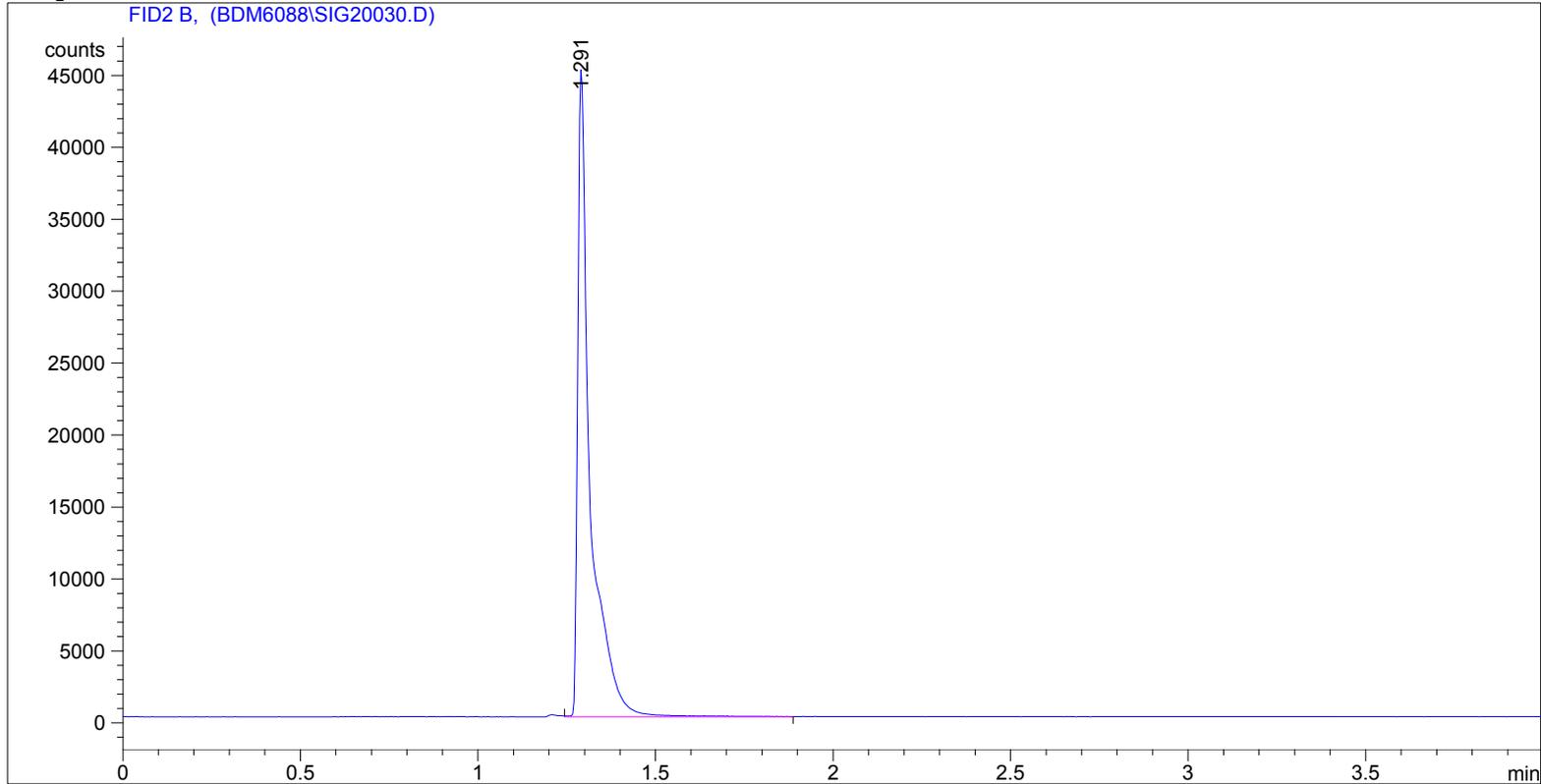
```

EO Inlet Run 1, Inj 4

```

=====
Injection Date   : 7/15/2016 9:24:03 AM
Sample Name     : Inlet Run 1                Location  : Vial 2
Acq. Operator   : JCH
Acq. Instrument : Instrument 1              Inj Volume: External
Method          : C:\HPCHEM\1\METHODS\ETHYDUAL.M
Last changed    : 7/2/2015 1:34:02 PM by JCH
ethylene oxide dual

```



```

=====
                          Area Percent Report
=====

```

```

Sorted By           :      Signal
Multiplier          :      1.0000
Dilution            :      1.0000
Use Multiplier & Dilution Factor with ISTDs

```

Signal 1: FID2 B,

Peak #	RetTime [min]	Type	Width [min]	Area counts*s	Height [counts]	Area %
1	1.291	VV	0.0344	1.10062e5	4.51794e4	1.000e2

```
Totals :                1.10062e5  4.51794e4
```

Results obtained with enhanced integrator!

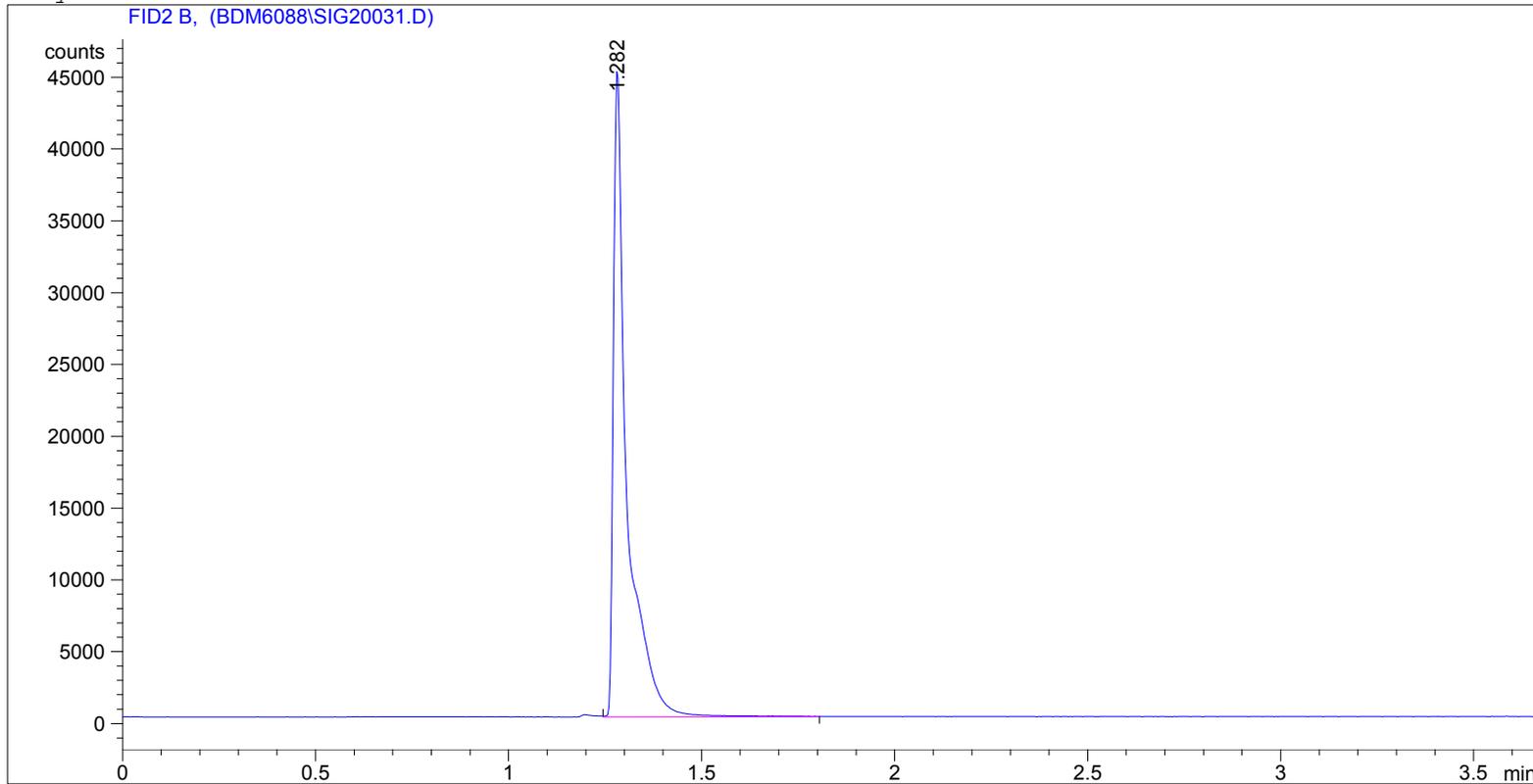
```

=====
*** End of Report ***

```

EO Inlet Run 1, Inj 5

```
=====
Injection Date   : 7/15/2016 9:33:51 AM
Sample Name      : Inlet Run 1                Location  : Vial 2
Acq. Operator    : JCH
Acq. Instrument  : Instrument 1              Inj Volume: External
Method           : C:\HPCHEM\1\METHODS\ETHYDUAL.M
Last changed     : 7/2/2015 1:34:02 PM by JCH
ethylene oxide dual
```



```
=====
                          Area Percent Report
=====
```

```
Sorted By           :      Signal
Multiplier           :      1.0000
Dilution             :      1.0000
Use Multiplier & Dilution Factor with ISTDs
```

Signal 1: FID2 B,

Peak #	RetTime [min]	Type	Width [min]	Area counts*s	Height [counts]	Area %
1	1.282	VV	0.0342	1.10062e5	4.54571e4	1.000e2

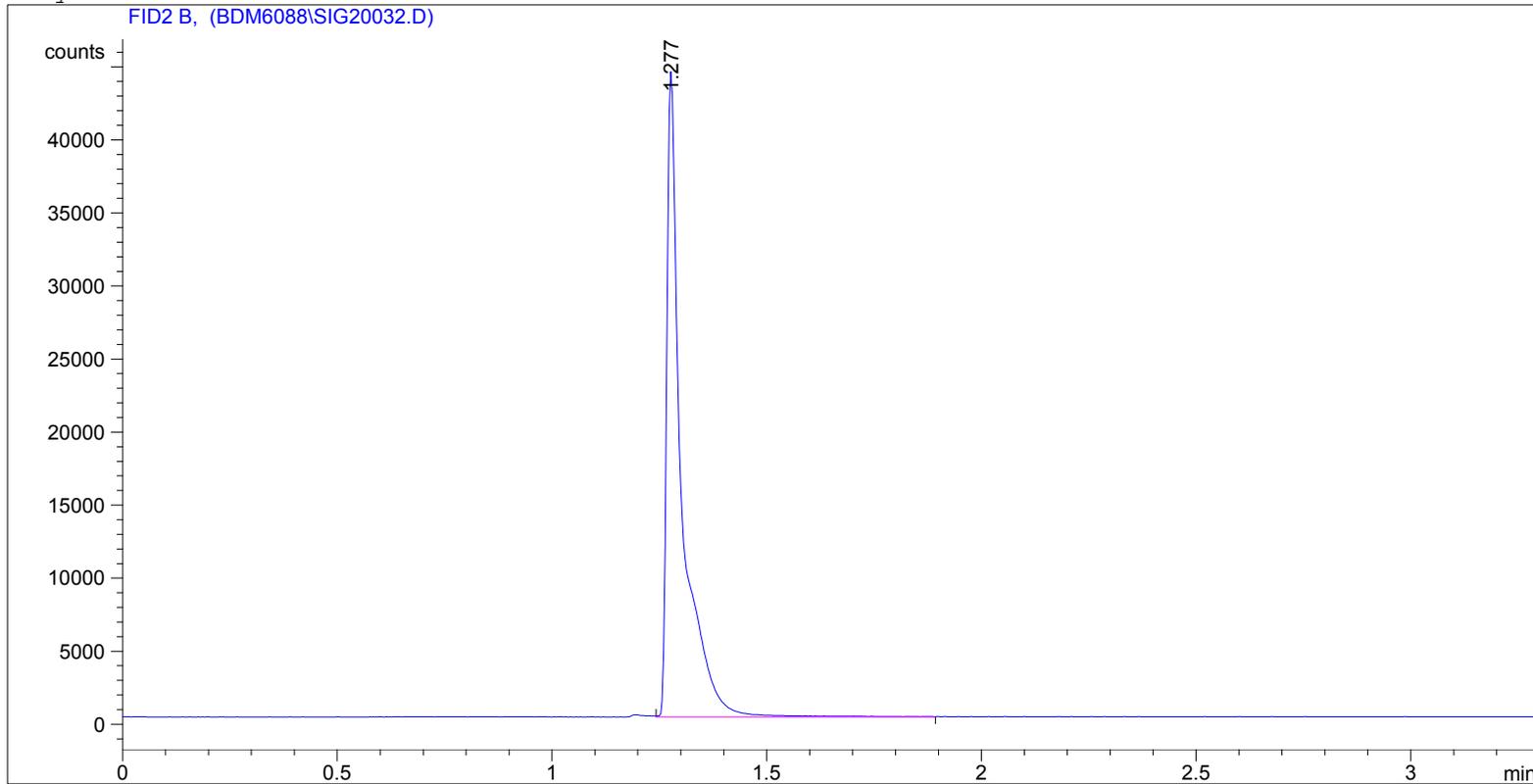
```
Totals :                1.10062e5  4.54571e4
```

Results obtained with enhanced integrator!

```
=====
*** End of Report ***
```

EO Inlet Run 2, Inj 1

```
=====
Injection Date   : 7/15/2016 9:53:57 AM
Sample Name     : Inlet Run 2                Location  : Vial 2
Acq. Operator   : JCH
Acq. Instrument : Instrument 1              Inj Volume: External
Method          : C:\HPCHEM\1\METHODS\ETHYDUAL.M
Last changed    : 7/2/2015 1:34:02 PM by JCH
ethylene oxide dual
```



```
=====
                          Area Percent Report
=====
```

```
Sorted By           :      Signal
Multiplier          :      1.0000
Dilution            :      1.0000
Use Multiplier & Dilution Factor with ISTDs
```

Signal 1: FID2 B,

Peak #	RetTime [min]	Type	Width [min]	Area counts*s	Height [counts]	Area %
1	1.277	VV	0.0344	1.07743e5	4.42879e4	1.000e2

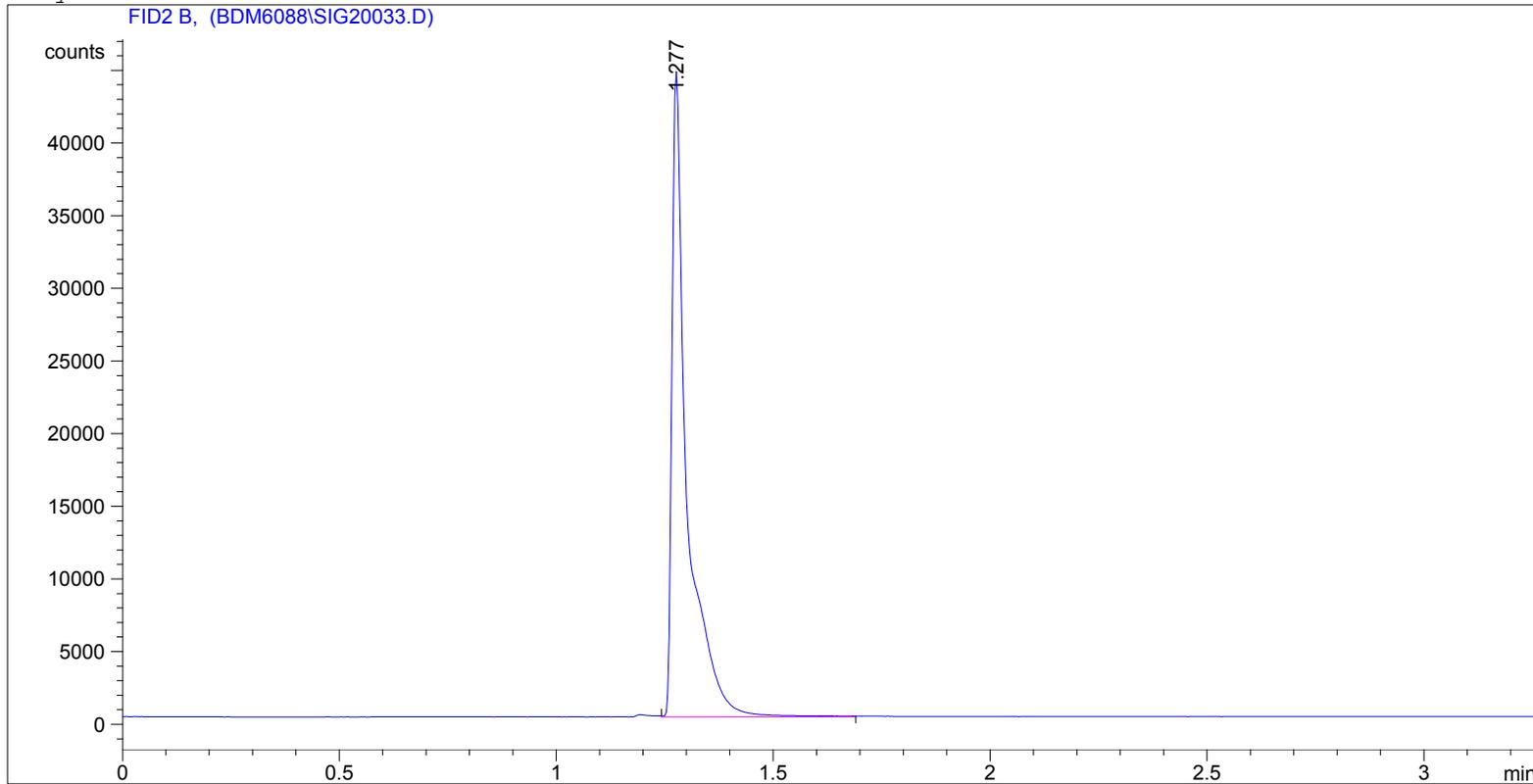
```
Totals :                1.07743e5  4.42879e4
```

Results obtained with enhanced integrator!

```
=====
*** End of Report ***
```

EO Inlet Run 2, Inj 2

```
=====
Injection Date   : 7/15/2016 10:05:04 AM
Sample Name      : Inlet Run 2                Location  : Vial 2
Acq. Operator    : JCH
Acq. Instrument  : Instrument 1              Inj Volume: External
Method           : C:\HPCHEM\1\METHODS\ETHYDUAL.M
Last changed     : 7/2/2015 1:34:02 PM by JCH
ethylene oxide dual
```



```
=====
                          Area Percent Report
=====
```

```
Sorted By           :      Signal
Multiplier           :      1.0000
Dilution             :      1.0000
Use Multiplier & Dilution Factor with ISTDs
```

Signal 1: FID2 B,

Peak #	RetTime [min]	Type	Width [min]	Area counts*s	Height [counts]	Area %
1	1.277	VV	0.0341	1.07144e5	4.44069e4	1.000e2

```
Totals :                1.07144e5  4.44069e4
```

Results obtained with enhanced integrator!

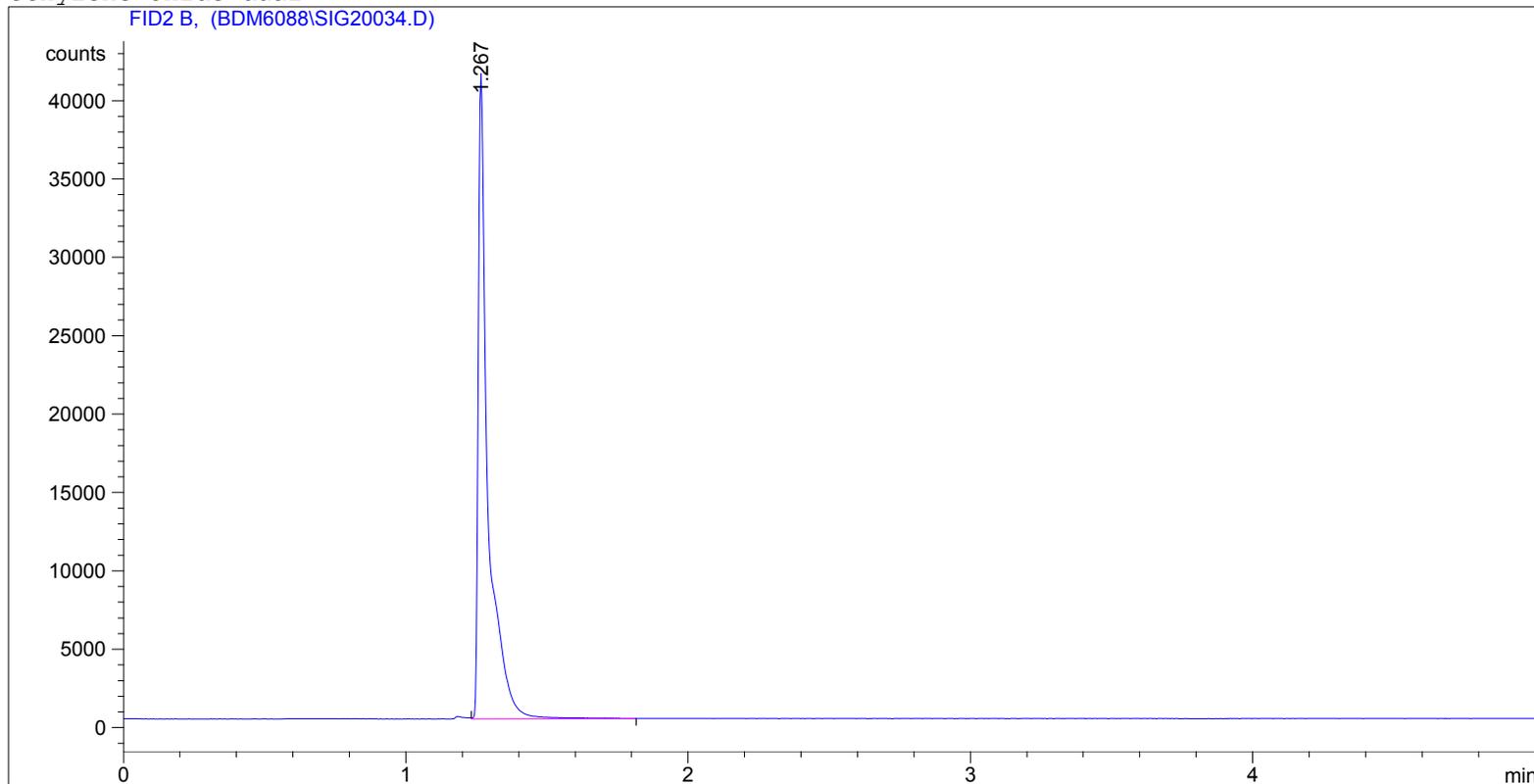
```
=====
*** End of Report ***
```

EO Inlet Run 2, Inj 3

```

=====
Injection Date   : 7/15/2016 10:19:40 AM
Sample Name     : Inlet Run 2                Location  : Vial 2
Acq. Operator  : JCH
Acq. Instrument : Instrument 1              Inj Volume: External
Method         : C:\HPCHEM\1\METHODS\ETHYDUAL.M
Last changed   : 7/2/2015 1:34:02 PM by JCH
ethylene oxide dual

```



```

=====
                          Area Percent Report
=====

```

```

Sorted By           :      Signal
Multiplier          :      1.0000
Dilution            :      1.0000
Use Multiplier & Dilution Factor with ISTDs

```

Signal 1: FID2 B,

Peak #	RetTime [min]	Type	Width [min]	Area counts*s	Height [counts]	Area %
1	1.267	VV	0.0340	9.87791e4	4.11697e4	1.000e2

```
Totals :                9.87791e4  4.11697e4
```

Results obtained with enhanced integrator!

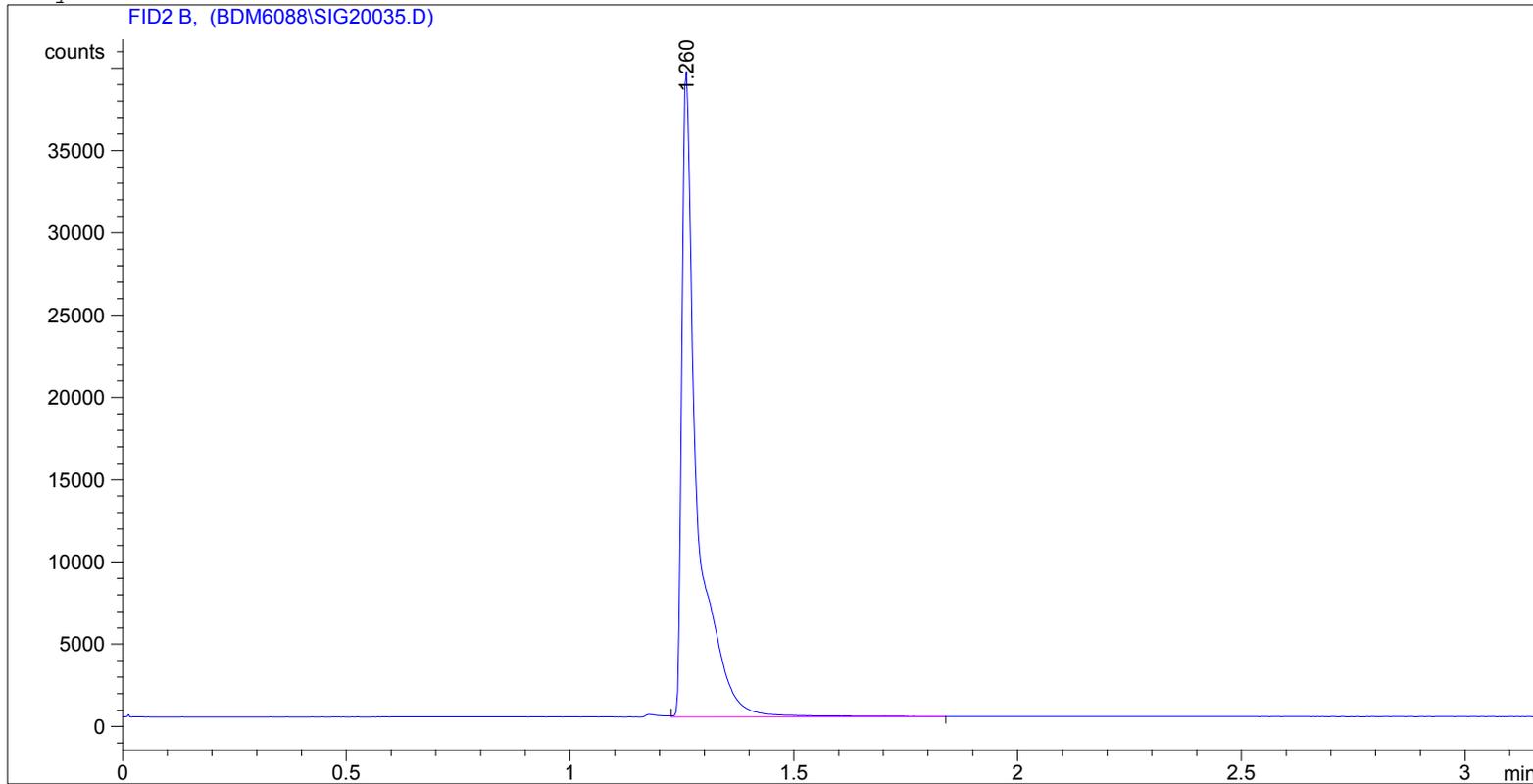
```

=====
*** End of Report ***

```

EO Inlet Run 2, Inj 4

```
=====
Injection Date   : 7/15/2016 10:31:31 AM
Sample Name     : Inlet Run 2                Location  : Vial 2
Acq. Operator   : JCH
Acq. Instrument : Instrument 1              Inj Volume: External
Method          : C:\HPCHEM\1\METHODS\ETHYDUAL.M
Last changed    : 7/2/2015 1:34:02 PM by JCH
ethylene oxide dual
```



```
=====
Area Percent Report
=====
```

```
Sorted By      : Signal
Multiplier     : 1.0000
Dilution       : 1.0000
Use Multiplier & Dilution Factor with ISTDs
```

Signal 1: FID2 B,

Peak #	RetTime [min]	Type	Width [min]	Area counts*s	Height [counts]	Area %
1	1.260	VV	0.0339	9.37739e4	3.92398e4	1.000e2

```
Totals :                9.37739e4  3.92398e4
```

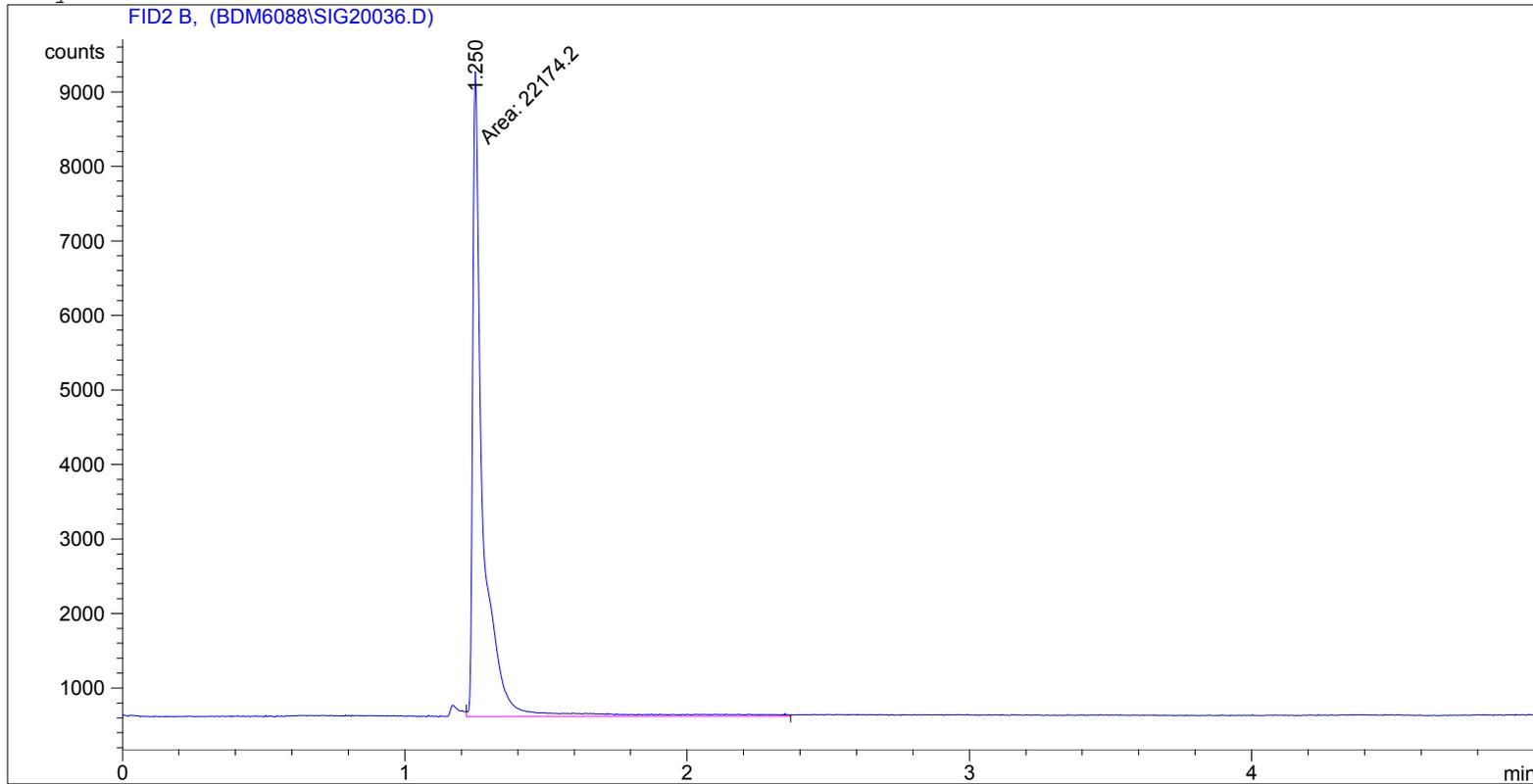
Results obtained with enhanced integrator!

```
=====
*** End of Report ***
```

EO Inlet Run 2, Inj 5

```

=====
Injection Date   : 7/15/2016 10:44:40 AM
Sample Name     : Inlet Run 2                Location  : Vial 2
Acq. Operator   : JCH
Acq. Instrument : Instrument 1              Inj Volume: External
Method          : C:\HPCHEM\1\METHODS\ETHYDUAL.M
Last changed    : 7/2/2015 1:34:02 PM by JCH
ethylene oxide dual
  
```



```

=====
                          Area Percent Report
=====
  
```

```

Sorted By           :      Signal
Multiplier          :      1.0000
Dilution           :      1.0000
Use Multiplier & Dilution Factor with ISTDs
  
```

Signal 1: FID2 B,

Peak #	RetTime [min]	Type	Width [min]	Area counts*s	Height [counts]	Area %
1	1.250	MM	0.0425	2.21742e4	8691.92188	1.000e2

```
Totals :                2.21742e4  8691.92188
```

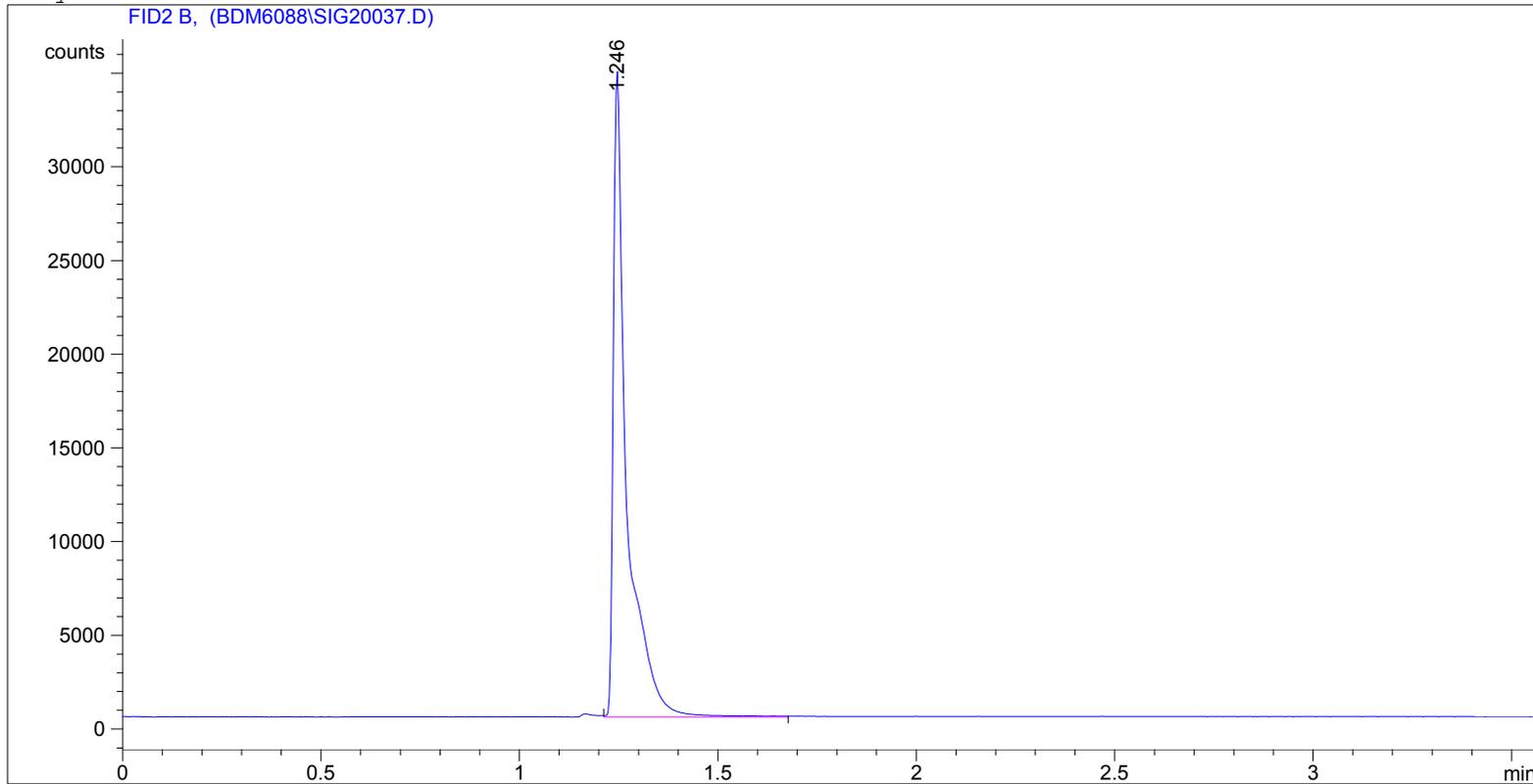
Results obtained with enhanced integrator!

```

=====
*** End of Report ***
  
```

EO Inlet Run 3, Inj 1

```
=====
Injection Date   : 7/15/2016 11:00:54 AM
Sample Name      : Inlet Run 2                Location  : Vial 2
Acq. Operator    : JCH
Acq. Instrument  : Instrument 1              Inj Volume: External
Method           : C:\HPCHEM\1\METHODS\ETHYDUAL.M
Last changed     : 7/2/2015 1:34:02 PM by JCH
ethylene oxide dual
```



```
=====
Area Percent Report
=====
```

```
Sorted By          :      Signal
Multiplier         :      1.0000
Dilution          :      1.0000
Use Multiplier & Dilution Factor with ISTDs
```

Signal 1: FID2 B,

Peak #	RetTime [min]	Type	Width [min]	Area counts*s	Height [counts]	Area %
1	1.246	VV	0.0337	8.16751e4	3.44440e4	1.000e2

```
Totals :                8.16751e4  3.44440e4
```

Results obtained with enhanced integrator!

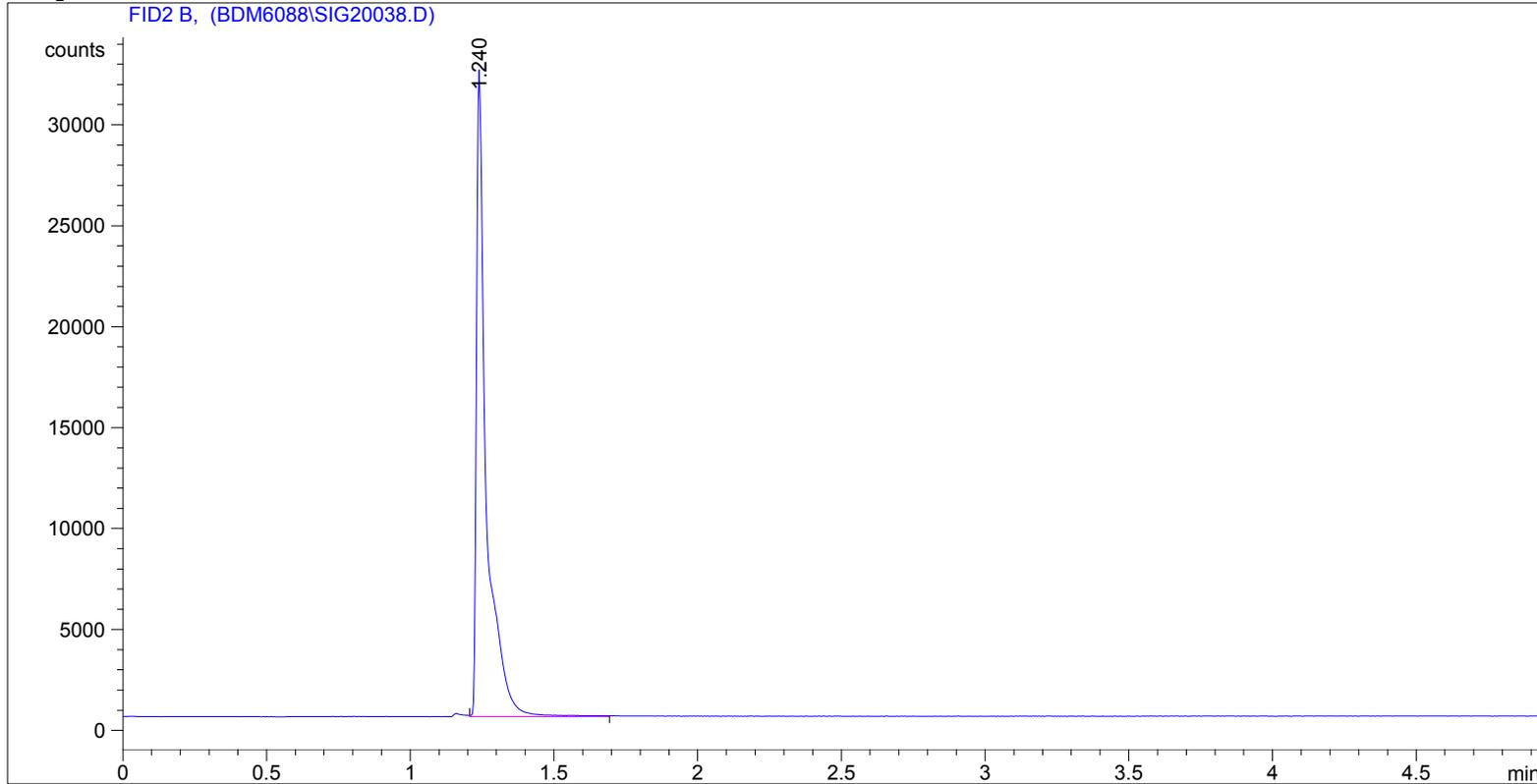
```
=====
*** End of Report ***
```

EO Inlet Run 3, Inj 2

```

=====
Injection Date   : 7/15/2016 11:16:14 AM
Sample Name     : Inlet Run 3                Location  : Vial 2
Acq. Operator   : JCH
Acq. Instrument : Instrument 1              Inj Volume: External
Method          : C:\HPCHEM\1\METHODS\ETHYDUAL.M
Last changed    : 7/2/2015 1:34:02 PM by JCH
ethylene oxide dual

```



```

=====
                          Area Percent Report
=====

```

```

Sorted By           :      Signal
Multiplier          :      1.0000
Dilution            :      1.0000
Use Multiplier & Dilution Factor with ISTDs

```

Signal 1: FID2 B,

Peak #	RetTime [min]	Type	Width [min]	Area counts*s	Height [counts]	Area %
1	1.240	VV	0.0325	7.55423e4	3.20632e4	1.000e2

```
Totals :                7.55423e4  3.20632e4
```

Results obtained with enhanced integrator!

```

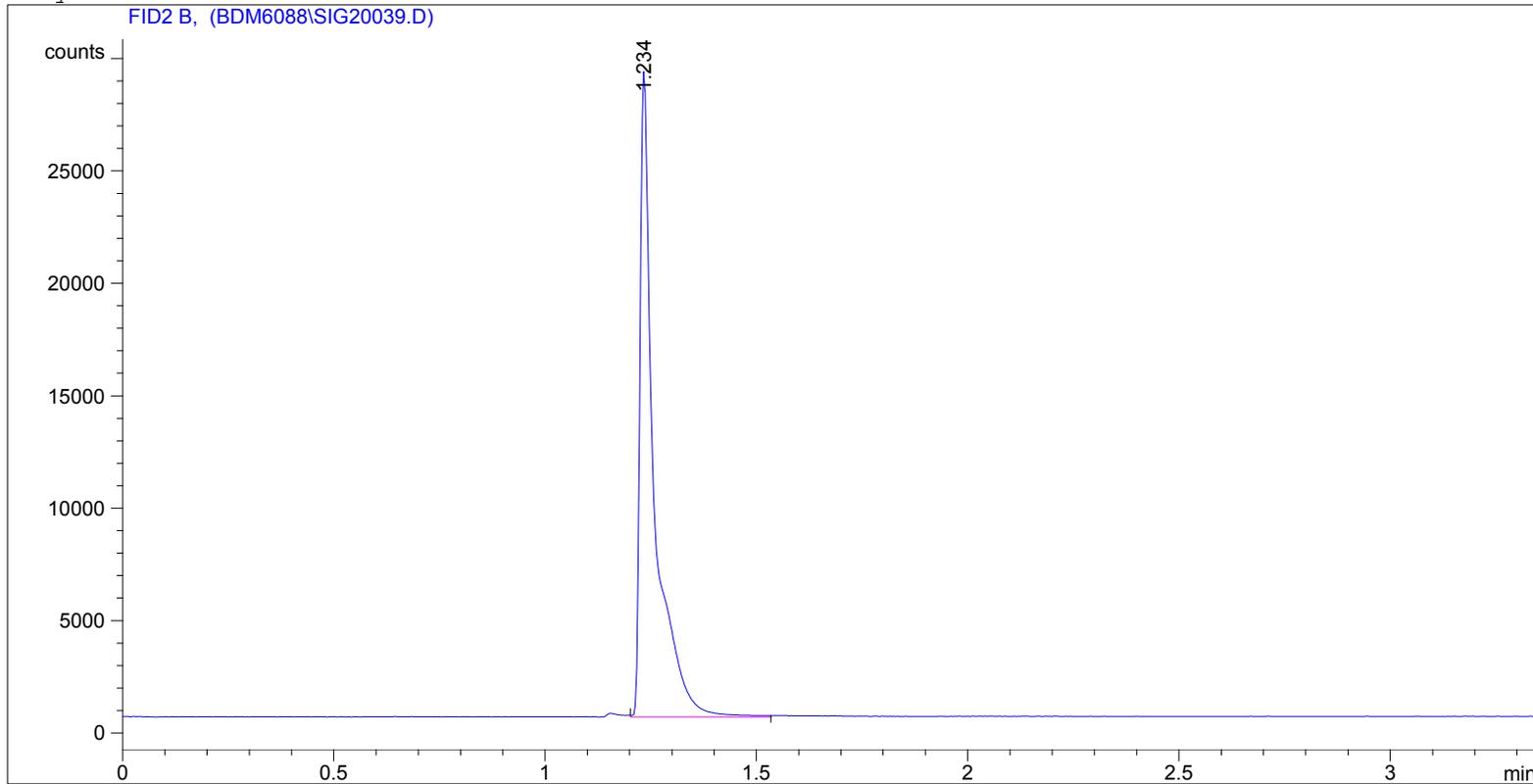
=====
*** End of Report ***

```

EO Inlet Run 3, Inj 3

```

=====
Injection Date   : 7/15/2016 11:28:48 AM
Sample Name     : Inlet Run 3                Location  : Vial 2
Acq. Operator   : JCH
Acq. Instrument : Instrument 1              Inj Volume: External
Method          : C:\HPCHEM\1\METHODS\ETHYDUAL.M
Last changed    : 7/2/2015 1:34:02 PM by JCH
ethylene oxide dual
  
```



```

=====
                          Area Percent Report
=====
  
```

```

Sorted By           :      Signal
Multiplier          :      1.0000
Dilution            :      1.0000
Use Multiplier & Dilution Factor with ISTDs
  
```

Signal 1: FID2 B,

Peak #	RetTime [min]	Type	Width [min]	Area counts*s	Height [counts]	Area %
1	1.234	VV	0.0331	6.69806e4	2.88013e4	1.000e2

```
Totals :                6.69806e4  2.88013e4
```

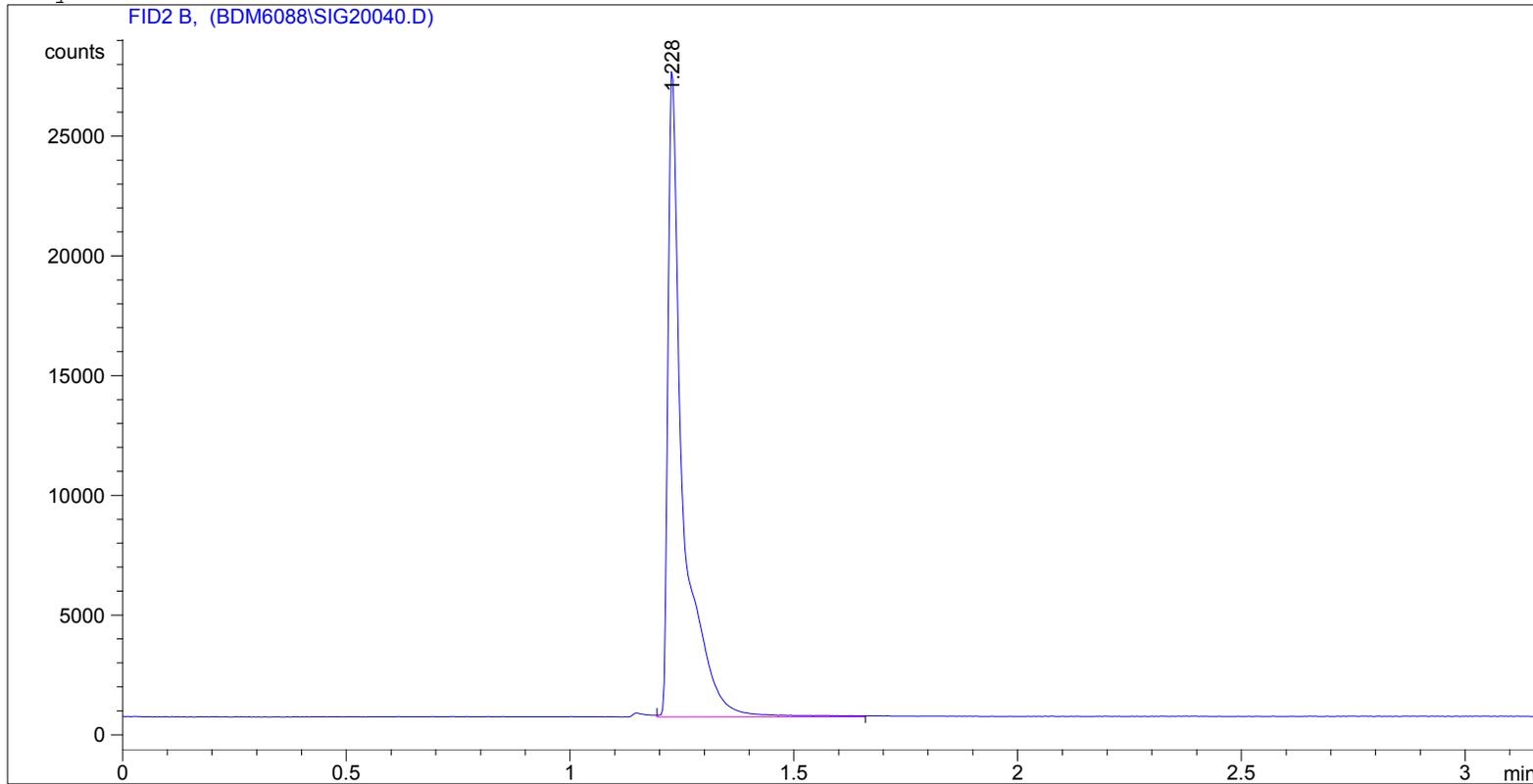
Results obtained with enhanced integrator!

```

=====
*** End of Report ***
  
```

EO Inlet Run 3, Inj 4

```
=====
Injection Date   : 7/15/2016 11:39:43 AM
Sample Name     : Inlet Run 3                Location  : Vial 2
Acq. Operator   : JCH
Acq. Instrument : Instrument 1              Inj Volume: External
Method          : C:\HPCHEM\1\METHODS\ETHYDUAL.M
Last changed    : 7/2/2015 1:34:02 PM by JCH
ethylene oxide dual
```



```
=====
                          Area Percent Report
=====
```

```
Sorted By           :      Signal
Multiplier          :      1.0000
Dilution           :      1.0000
Use Multiplier & Dilution Factor with ISTDs
```

Signal 1: FID2 B,

Peak #	RetTime [min]	Type	Width [min]	Area counts*s	Height [counts]	Area %
1	1.228	VV	0.0331	6.34004e4	2.72794e4	1.000e2

```
Totals :                6.34004e4  2.72794e4
```

Results obtained with enhanced integrator!

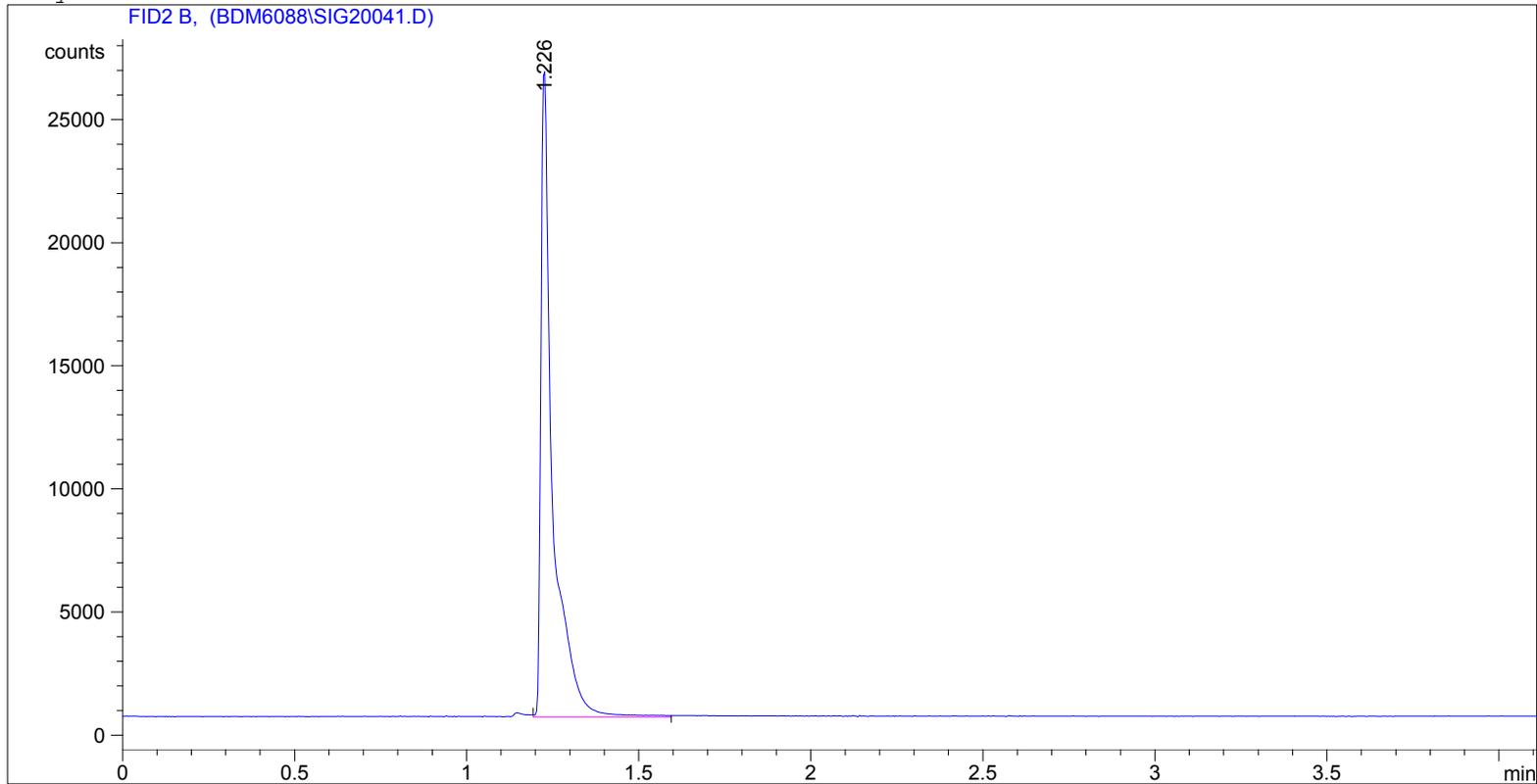
```
=====
*** End of Report ***
```

EO Inlet Run 3, Inj 5

```

=====
Injection Date   : 7/15/2016 11:43:52 AM
Sample Name     : Inlet Run 3                Location  : Vial 2
Acq. Operator   : JCH
Acq. Instrument : Instrument 1              Inj Volume: External
Method          : C:\HPCHEM\1\METHODS\ETHYDUAL.M
Last changed    : 7/2/2015 1:34:02 PM by JCH
ethylene oxide dual

```



```

=====
                          Area Percent Report
=====

```

```

Sorted By           :      Signal
Multiplier          :      1.0000
Dilution            :      1.0000
Use Multiplier & Dilution Factor with ISTDs

```

Signal 1: FID2 B,

Peak #	RetTime [min]	Type	Width [min]	Area counts*s	Height [counts]	Area %
1	1.226	VV	0.0334	6.19170e4	2.63211e4	1.000e2

```
Totals :                6.19170e4  2.63211e4
```

Results obtained with enhanced integrator!

```

=====
*** End of Report ***

```

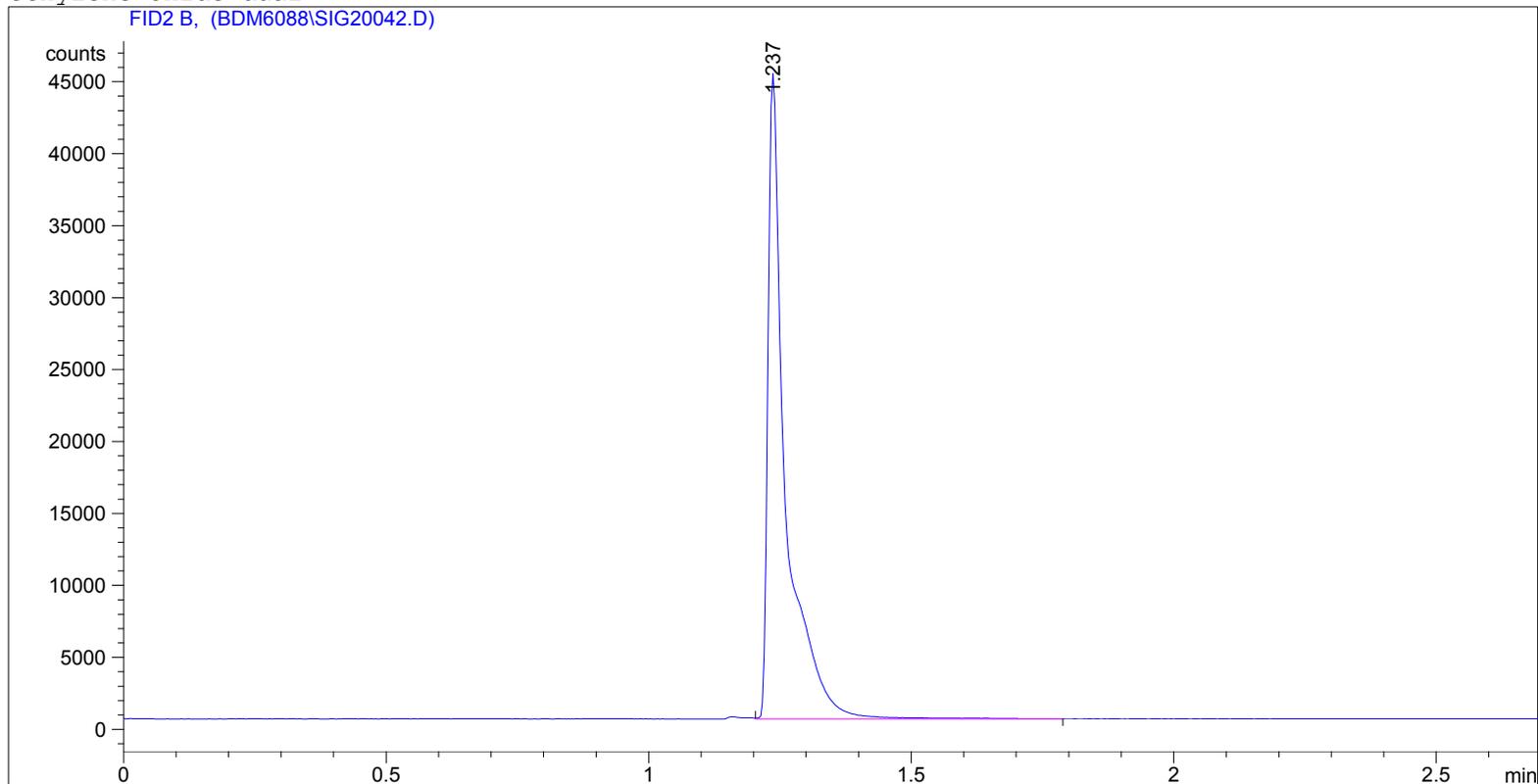
**Inlet Post-Cal**

EO Inlet Post Cal 2605ppm

```

=====
Injection Date   : 7/15/2016 12:12:32 PM
Sample Name     : Inlet Post Cal           Location  : Vial 2
Acq. Operator  : JCH
Acq. Instrument : Instrument 1             Inj Volume: External
Method         : C:\HPCHEM\1\METHODS\ETHYDUAL.M
Last changed   : 7/2/2015 1:34:02 PM by JCH
ethylene oxide dual

```



```

=====
                          Area Percent Report
=====

```

```

Sorted By           :      Signal
Multiplier          :      1.0000
Dilution            :      1.0000
Use Multiplier & Dilution Factor with ISTDs

```

Signal 1: FID2 B,

Peak #	RetTime [min]	Type	Width [min]	Area counts*s	Height [counts]	Area %
1	1.237	VV	0.0324	1.05265e5	4.48659e4	1.000e2

```
Totals :                1.05265e5  4.48659e4
```

Results obtained with enhanced integrator!

```

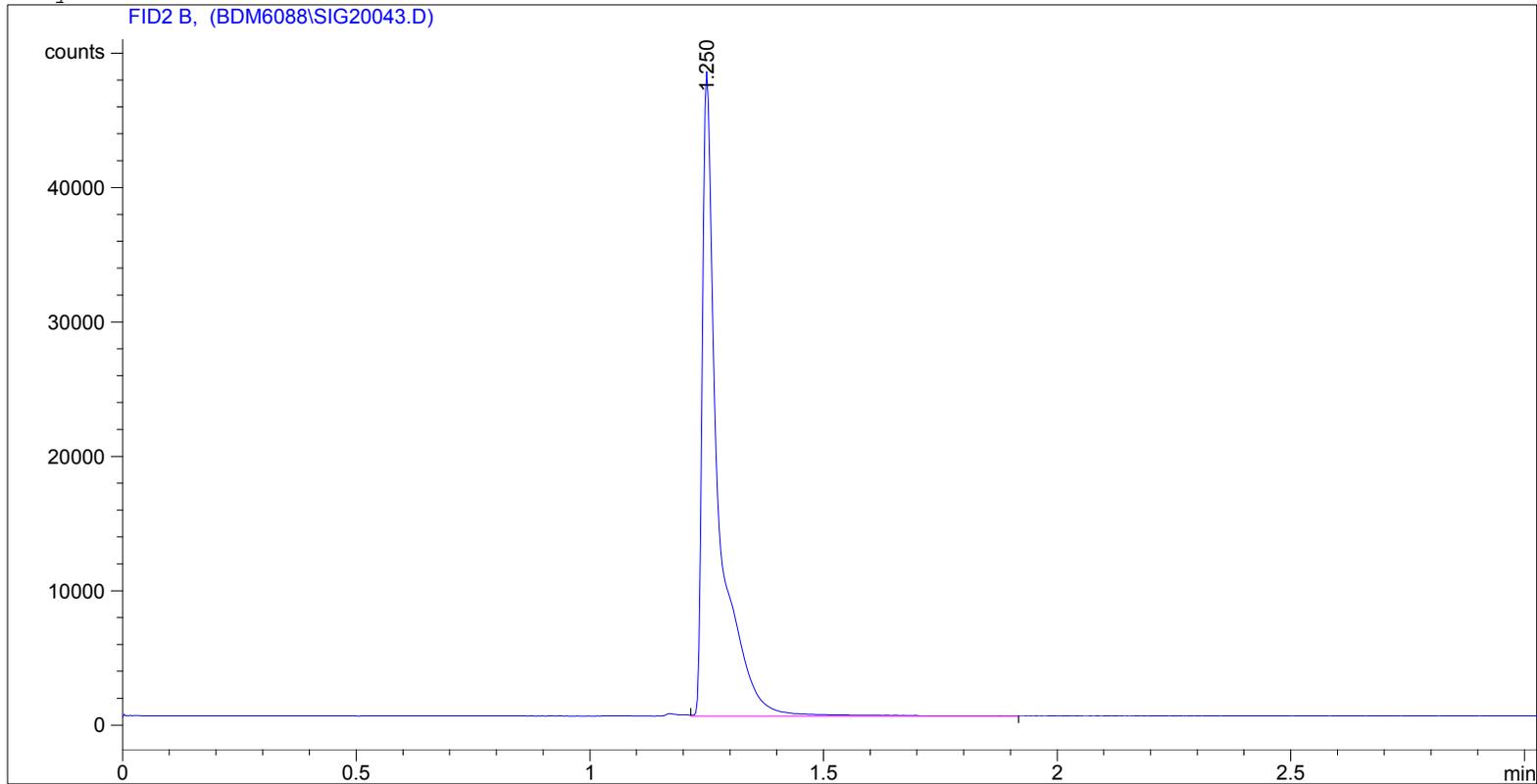
=====
*** End of Report ***

```

EO Inlet Post Cal 2605ppm

```

=====
Injection Date   : 7/15/2016 12:23:25 PM
Sample Name     : Inlet Post Cal           Location  : Vial 2
Acq. Operator   : JCH
Acq. Instrument : Instrument 1             Inj Volume: External
Method          : C:\HPCHEM\1\METHODS\ETHYDUAL.M
Last changed    : 7/2/2015 1:34:02 PM by JCH
ethylene oxide dual
  
```



```

=====
                          Area Percent Report
=====
  
```

```

Sorted By           :      Signal
Multiplier          :      1.0000
Dilution            :      1.0000
Use Multiplier & Dilution Factor with ISTDs
  
```

Signal 1: FID2 B,

Peak #	RetTime [min]	Type	Width [min]	Area counts*s	Height [counts]	Area %
1	1.250	VV	0.0328	1.14269e5	4.79798e4	1.000e2

```
Totals :                1.14269e5  4.79798e4
```

Results obtained with enhanced integrator!

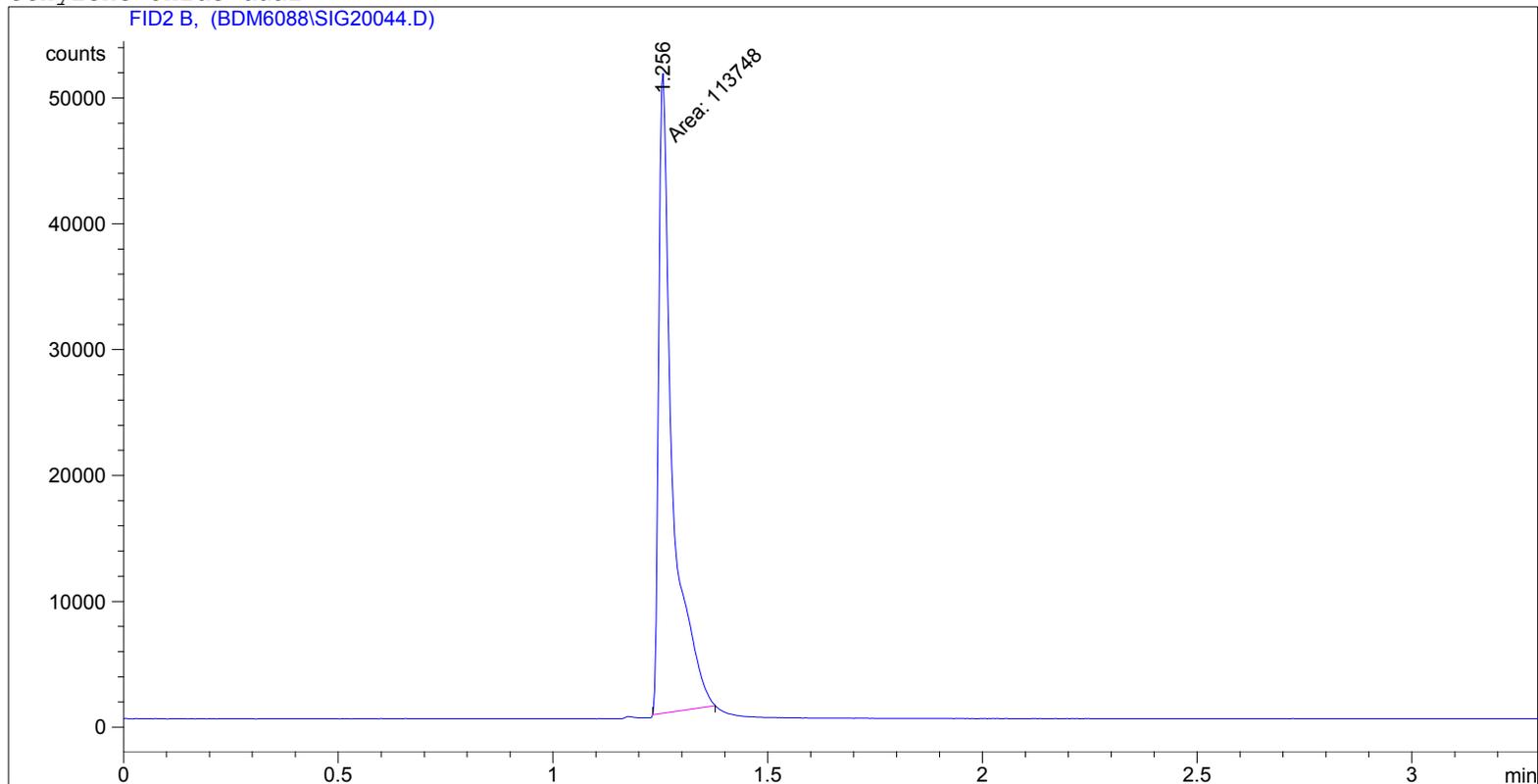
```

=====
*** End of Report ***
  
```

EO Inlet Post Cal 2605ppm

```

=====
Injection Date   : 7/15/2016 12:29:14 PM
Sample Name     : Inlet Post Cal           Location  : Vial 2
Acq. Operator   : JCH
Acq. Instrument : Instrument 1             Inj Volume: External
Method          : C:\HPCHEM\1\METHODS\ETHYDUAL.M
Last changed    : 7/2/2015 1:34:02 PM by JCH
ethylene oxide dual
  
```



```

=====
                          Area Percent Report
=====
  
```

```

Sorted By           :      Signal
Multiplier          :      1.0000
Dilution            :      1.0000
Use Multiplier & Dilution Factor with ISTDs
  
```

Signal 1: FID2 B,

Peak #	RetTime [min]	Type	Width [min]	Area counts*s	Height [counts]	Area %
1	1.256	MM	0.0370	1.13748e5	5.12344e4	1.000e2

```
Totals :                1.13748e5  5.12344e4
```

Results obtained with enhanced integrator!

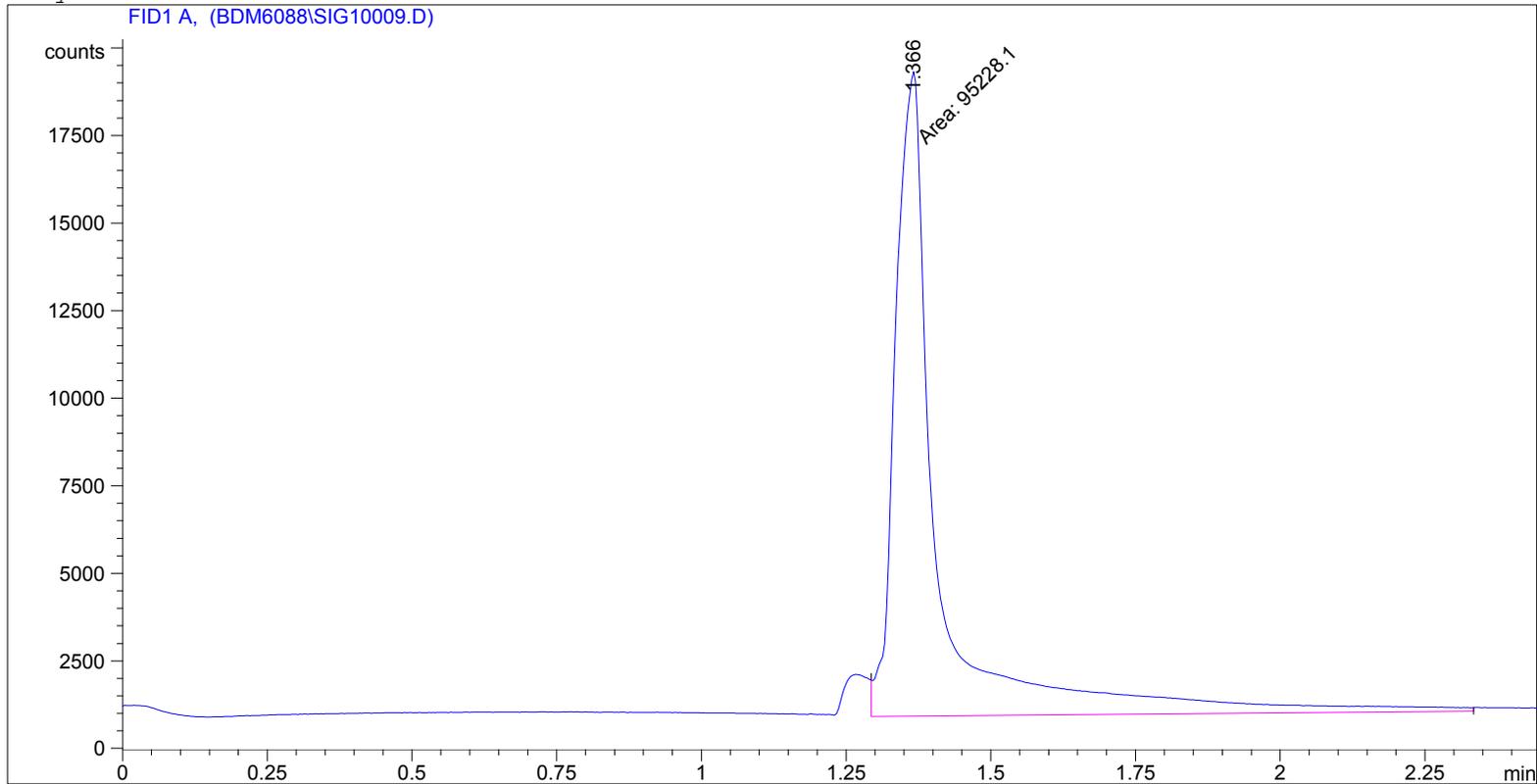
```

=====
*** End of Report ***
  
```

**Outlet Pre-Cal**

EO Pre-Cal 51.5ppm

```
=====
Injection Date   : 7/14/2016 12:27:55 PM
Sample Name      : Pre-Cal 51.5                Location  : Vial 1
Acq. Operator    : JCH
Acq. Instrument  : Instrument 1                Inj Volume: External
Method           : C:\HPCHEM\1\METHODS\ETHYDUAL.M
Last changed     : 7/2/2015 1:34:02 PM by JCH
ethylene oxide dual
```



```
=====
                          Area Percent Report
=====
```

```
Sorted By           :      Signal
Multiplier           :      1.0000
Dilution             :      1.0000
Use Multiplier & Dilution Factor with ISTDs
```

Signal 1: FID1 A,

Peak #	RetTime [min]	Type	Width [min]	Area counts*s	Height [counts]	Area %
1	1.366	MM	0.0861	9.52281e4	1.84250e4	1.000e2

```
Totals :                9.52281e4  1.84250e4
```

Results obtained with enhanced integrator!

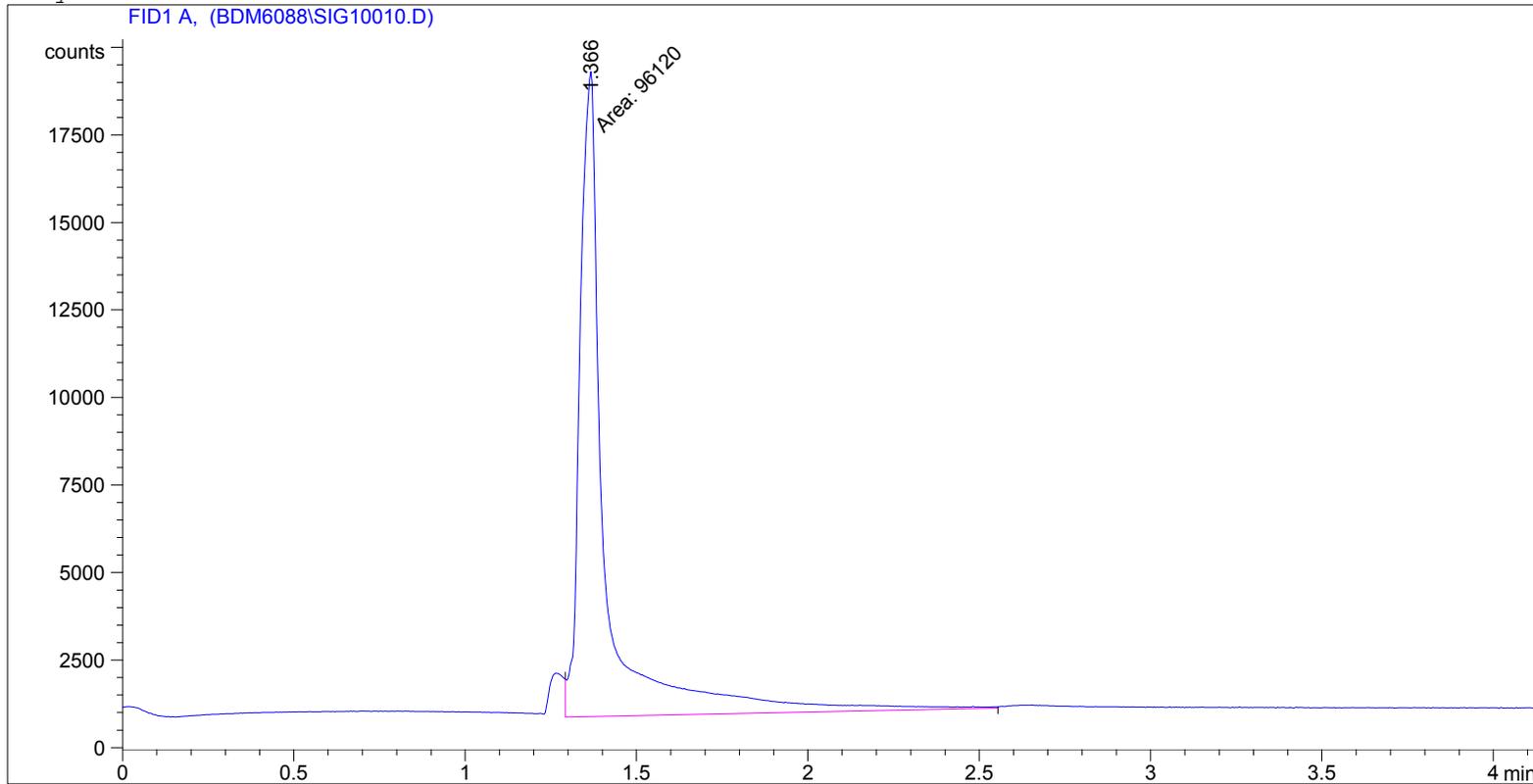
```
=====
*** End of Report ***
```

EO Pre-Cal 51.5ppm

```

=====
Injection Date   : 7/14/2016 12:30:46 PM
Sample Name     : Pre-Cal 51.5                Location  : Vial 1
Acq. Operator   : JCH
Acq. Instrument : Instrument 1                Inj Volume: External
Method          : C:\HPCHEM\1\METHODS\ETHYDUAL.M
Last changed    : 7/2/2015 1:34:02 PM by JCH
ethylene oxide dual

```



```

=====
                          Area Percent Report
=====

```

```

Sorted By           :      Signal
Multiplier          :      1.0000
Dilution            :      1.0000
Use Multiplier & Dilution Factor with ISTDs

```

Signal 1: FID1 A,

Peak #	RetTime [min]	Type	Width [min]	Area counts*s	Height [counts]	Area %
1	1.366	MM	0.0868	9.61200e4	1.84459e4	1.000e2

```
Totals :                9.61200e4  1.84459e4
```

Results obtained with enhanced integrator!

```

=====
*** End of Report ***

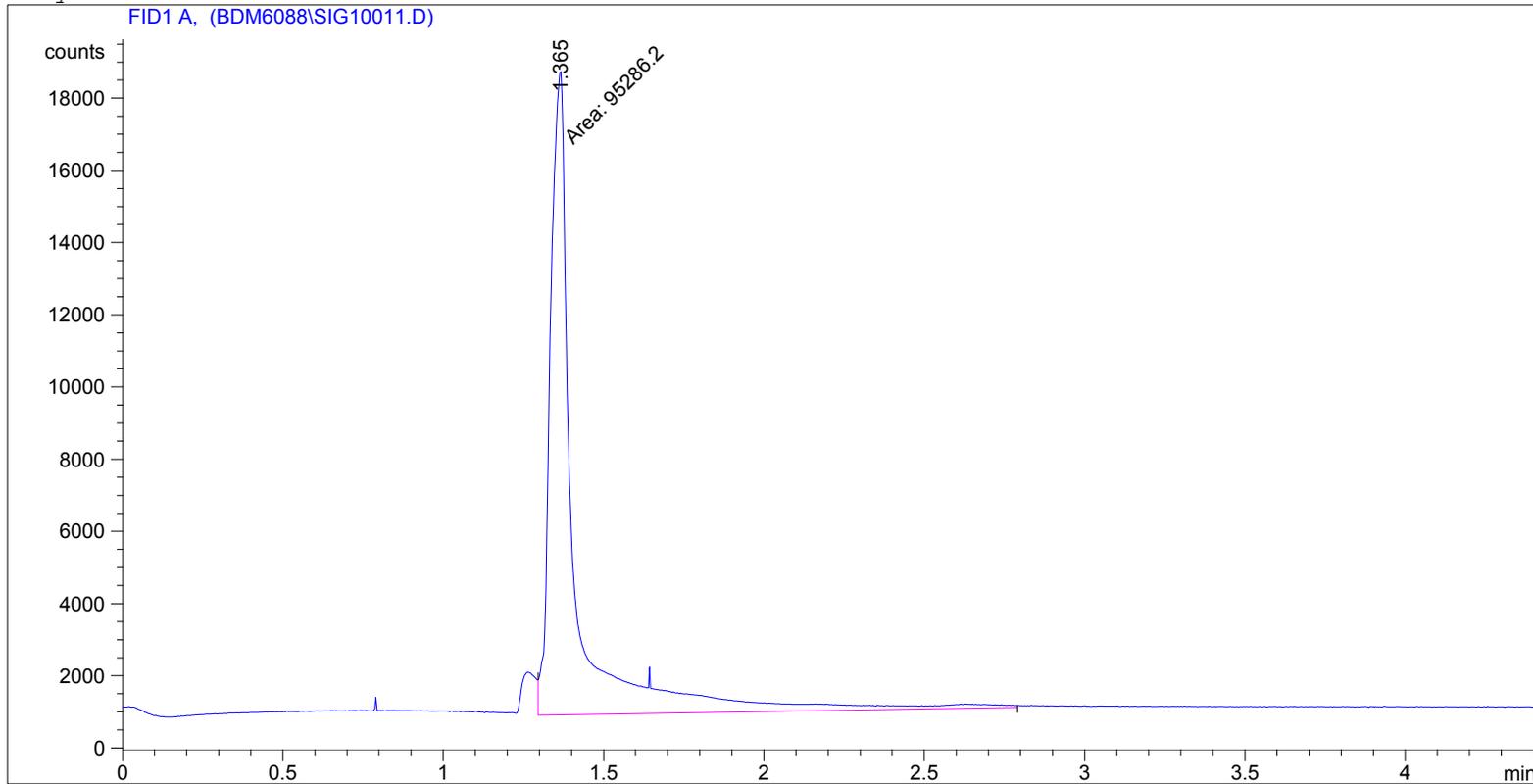
```

EO Pre-Cal 51.5ppm

```

=====
Injection Date   : 7/14/2016 12:35:23 PM
Sample Name     : Pre-Cal 51.5                Location  : Vial 1
Acq. Operator  : JCH
Acq. Instrument : Instrument 1                Inj Volume: External
Method         : C:\HPCHEM\1\METHODS\ETHYDUAL.M
Last changed   : 7/2/2015 1:34:02 PM by JCH
ethylene oxide dual

```



```

=====
                          Area Percent Report
=====

```

```

Sorted By           :      Signal
Multiplier          :      1.0000
Dilution            :      1.0000
Use Multiplier & Dilution Factor with ISTDs

```

Signal 1: FID1 A,

Peak #	RetTime [min]	Type	Width [min]	Area counts*s	Height [counts]	Area %
1	1.365	MM	0.0887	9.52862e4	1.79042e4	1.000e2

```
Totals :                9.52862e4  1.79042e4
```

Results obtained with enhanced integrator!

```

=====
*** End of Report ***

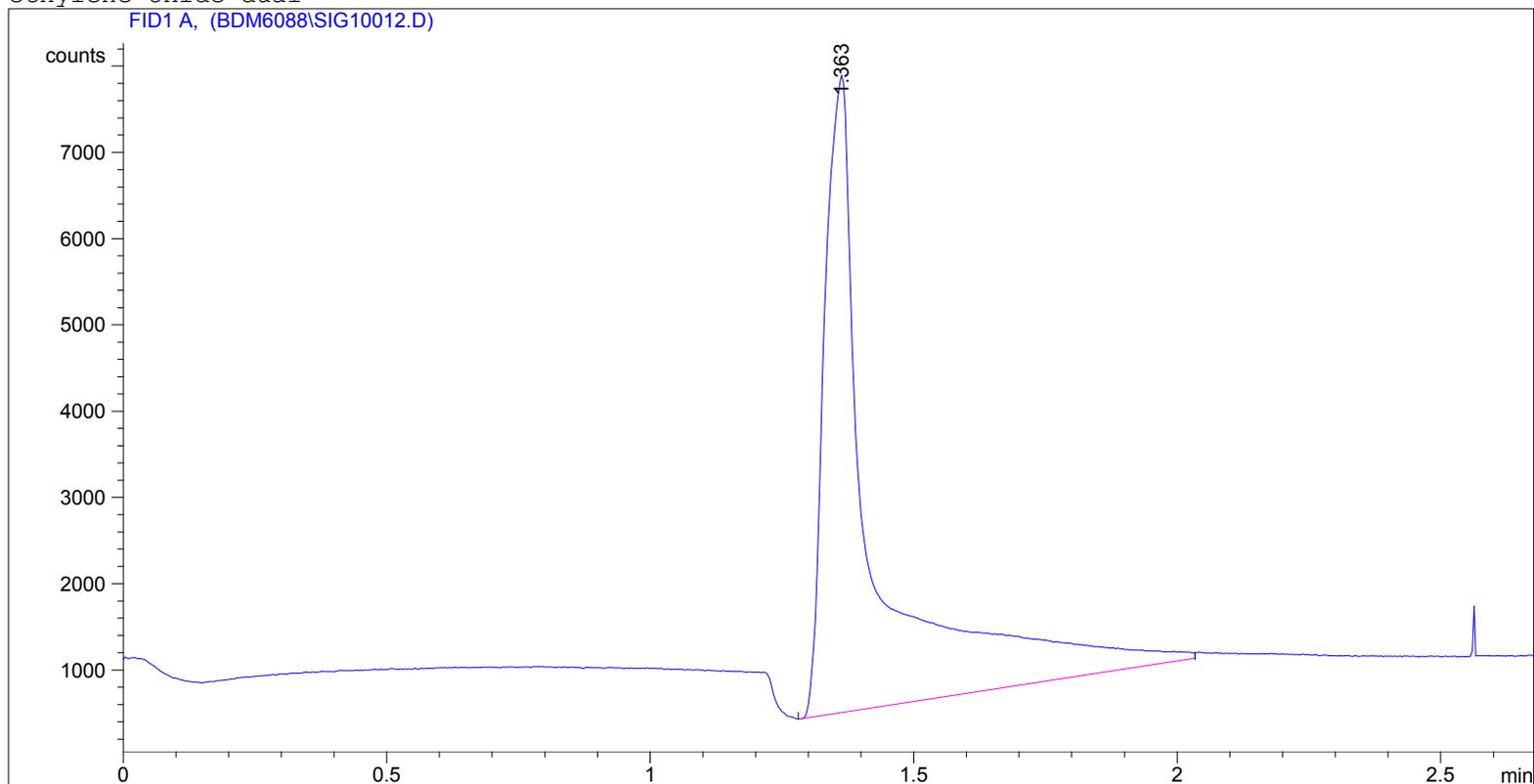
```

EO Outlet Pre-Cal 25.75ppm

```

=====
Injection Date   : 7/14/2016 12:48:20 PM
Sample Name     : Pre-Cal 25.75                Location  : Vial 1
Acq. Operator   : JCH
Acq. Instrument : Instrument 1                Inj Volume : External
Method          : C:\HPCHEM\1\METHODS\ETHYDUAL.M
Last changed    : 7/2/2015 1:34:02 PM by JCH
ethylene oxide dual

```



```

=====
                          Area Percent Report
=====

```

```

Sorted By           :      Signal
Multiplier          :      1.0000
Dilution            :      1.0000
Use Multiplier & Dilution Factor with ISTDs

```

Signal 1: FID1 A,

Peak #	RetTime [min]	Type	Width [min]	Area counts*s	Height [counts]	Area %
1	1.363	VV	0.0941	4.88317e4	7389.64111	1.000e2

```
Totals :                4.88317e4  7389.64111
```

Results obtained with enhanced integrator!

```

=====
*** End of Report ***

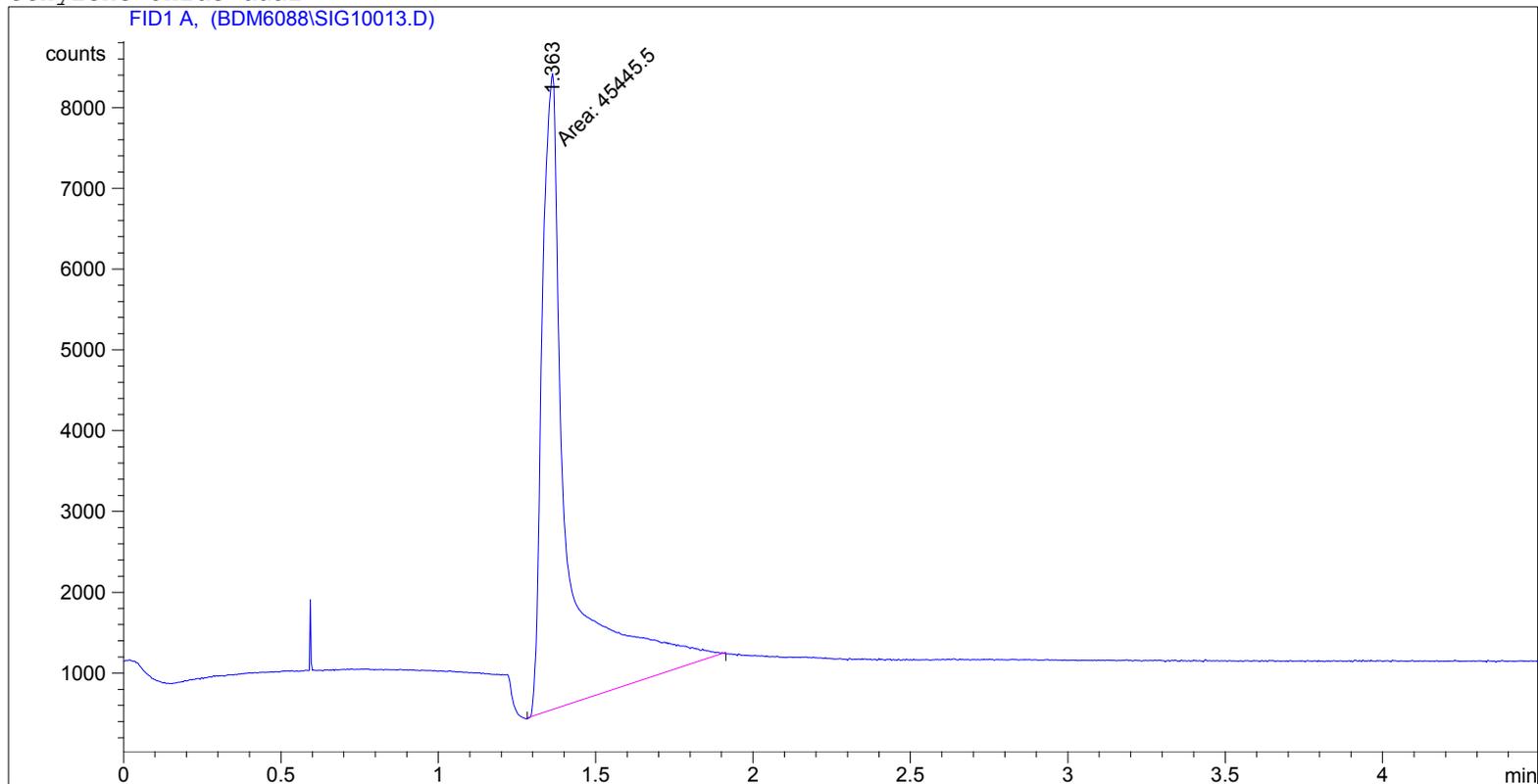
```

EO Outlet Pre-Cal 25.75ppm

```

=====
Injection Date   : 7/14/2016 12:51:27 PM
Sample Name     : Pre-Cal 25.75                Location  : Vial 1
Acq. Operator   : JCH
Acq. Instrument : Instrument 1                 Inj Volume: External
Method          : C:\HPCHEM\1\METHODS\ETHYDUAL.M
Last changed    : 7/2/2015 1:34:02 PM by JCH
ethylene oxide dual

```



```

=====
                          Area Percent Report
=====

```

```

Sorted By           :      Signal
Multiplier          :      1.0000
Dilution           :      1.0000
Use Multiplier & Dilution Factor with ISTDs

```

Signal 1: FID1 A,

Peak #	RetTime [min]	Type	Width [min]	Area counts*s	Height [counts]	Area %
1	1.363	MM	0.0961	4.54455e4	7883.25342	1.000e2

```
Totals :                4.54455e4  7883.25342
```

Results obtained with enhanced integrator!

```

=====
*** End of Report ***

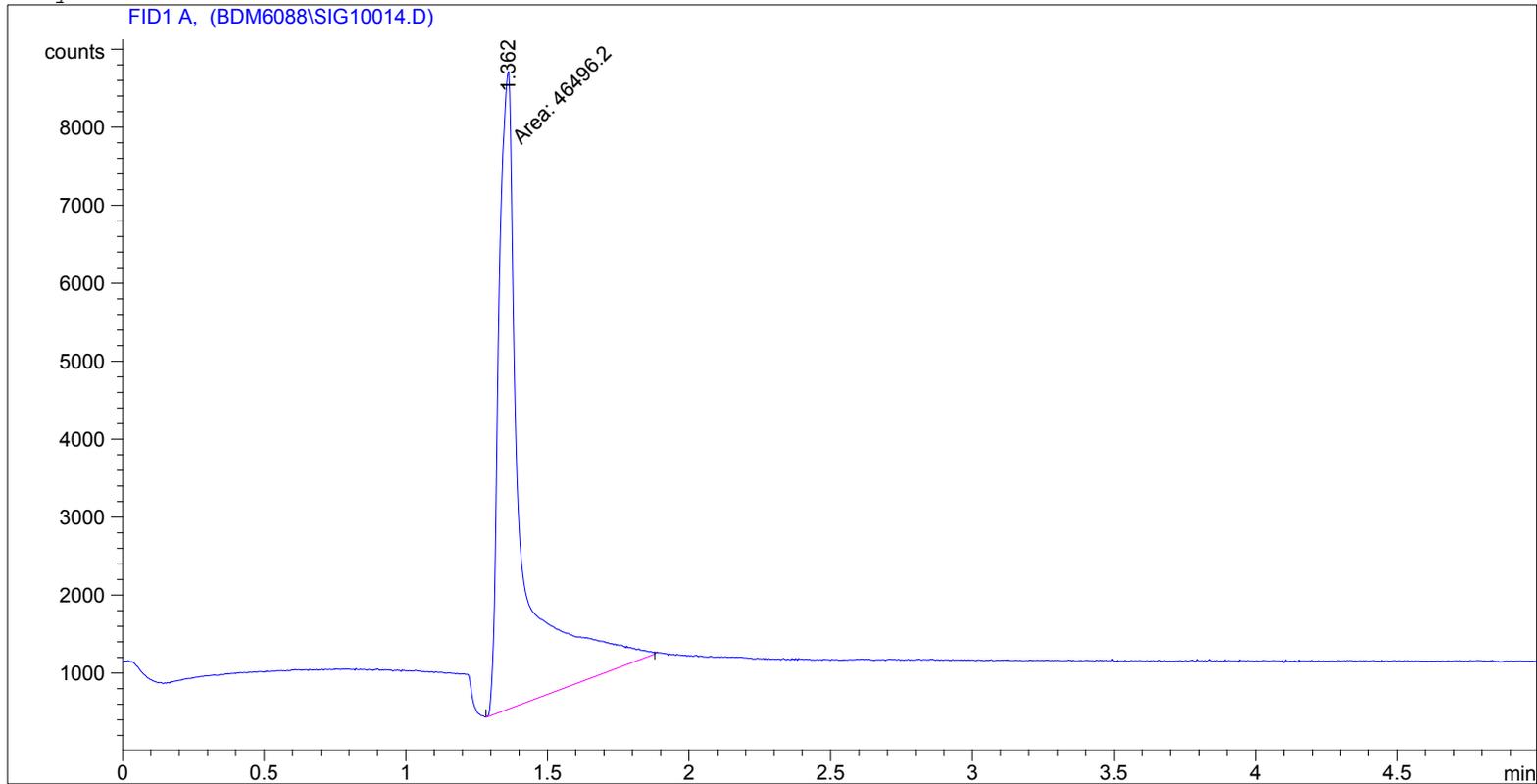
```

EO Outlet Pre-Cal 25.75ppm

```

=====
Injection Date   : 7/14/2016 12:56:14 PM
Sample Name     : Pre-Cal 25.75                Location  : Vial 1
Acq. Operator   : JCH
Acq. Instrument : Instrument 1                Inj Volume : External
Method          : C:\HPCHEM\1\METHODS\ETHYDUAL.M
Last changed    : 7/2/2015 1:34:02 PM by JCH
ethylene oxide dual

```



```

=====
                          Area Percent Report
=====

```

```

Sorted By           :      Signal
Multiplier          :      1.0000
Dilution            :      1.0000
Use Multiplier & Dilution Factor with ISTDs

```

Signal 1: FID1 A,

Peak #	RetTime [min]	Type	Width [min]	Area counts*s	Height [counts]	Area %
1	1.362	MM	0.0943	4.64962e4	8218.49609	1.000e2

```
Totals :                4.64962e4  8218.49609
```

Results obtained with enhanced integrator!

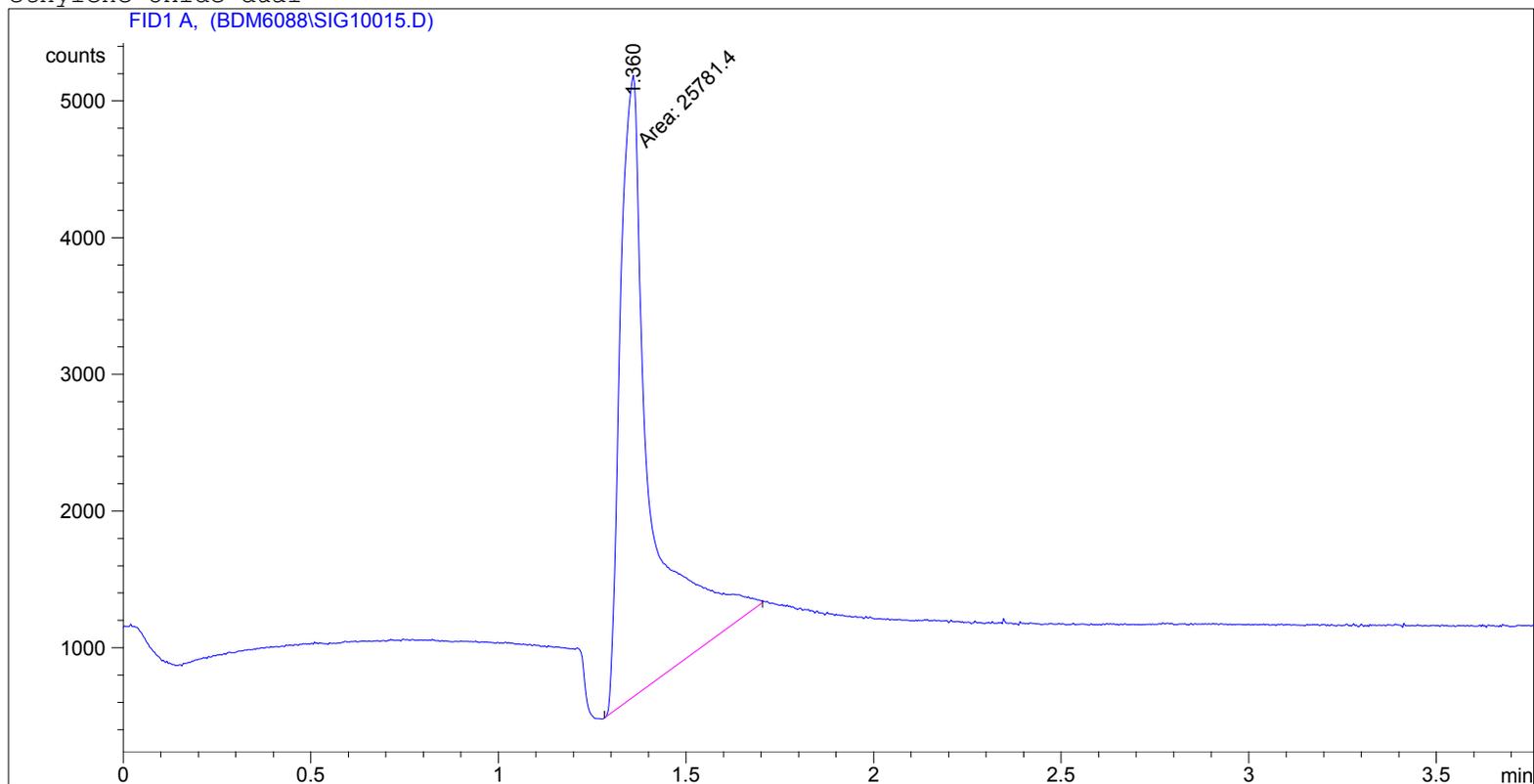
```

=====
*** End of Report ***

```

EO Outlet Pre-Cal 12.8ppm

```
=====
Injection Date   : 7/14/2016 1:05:14 PM
Sample Name     : Pre-Cal 12.8                Location  : Vial 1
Acq. Operator   : JCH
Acq. Instrument : Instrument 1                Inj Volume: External
Method          : C:\HPCHEM\1\METHODS\ETHYDUAL.M
Last changed    : 7/2/2015 1:34:02 PM by JCH
ethylene oxide dual
```



```
=====
Area Percent Report
=====
```

```
Sorted By      :      Signal
Multiplier     :      1.0000
Dilution       :      1.0000
Use Multiplier & Dilution Factor with ISTDs
```

Signal 1: FID1 A,

Peak #	RetTime [min]	Type	Width [min]	Area counts*s	Height [counts]	Area %
1	1.360	MM	0.0943	2.57814e4	4555.22168	1.000e2

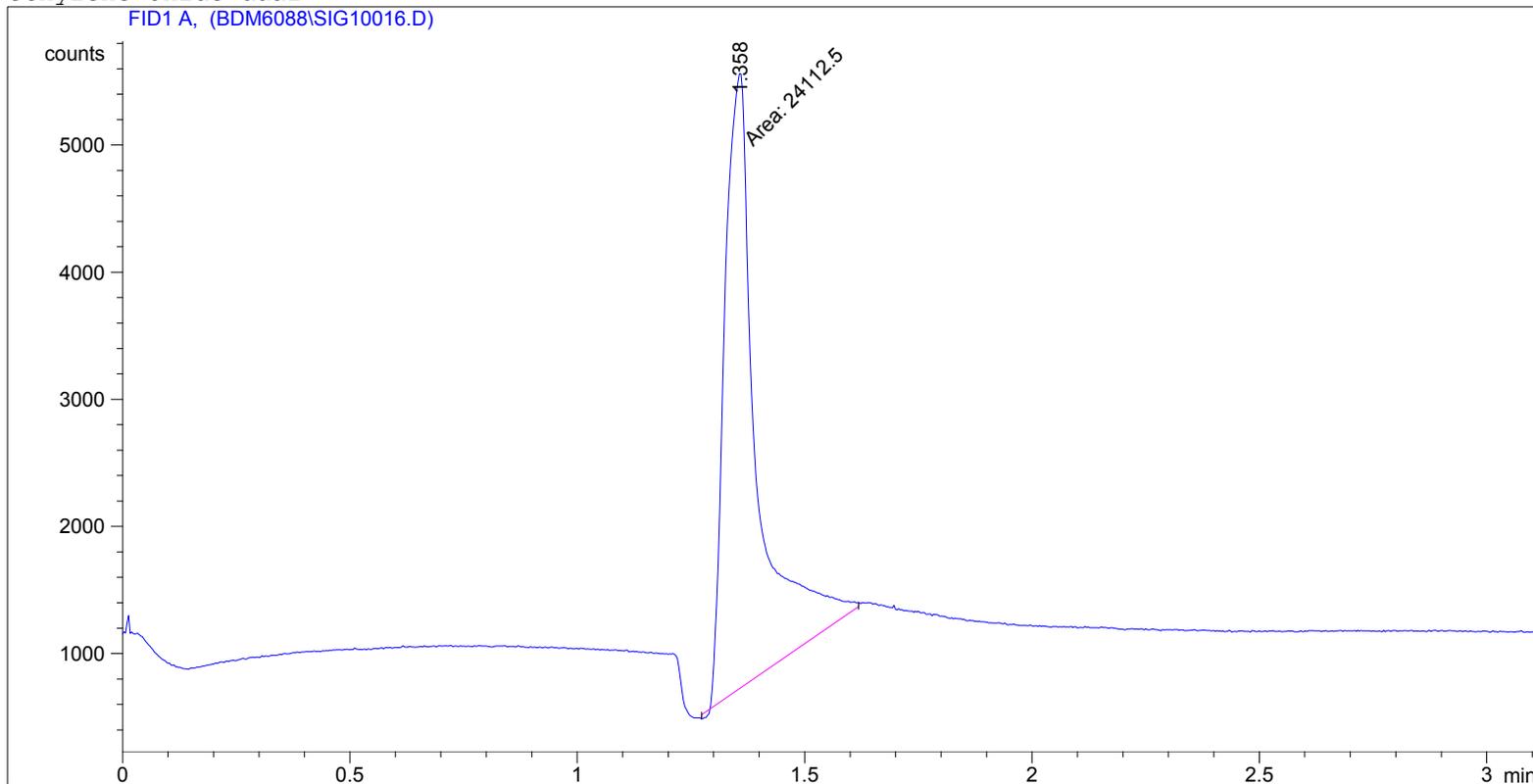
```
Totals :                2.57814e4  4555.22168
```

Results obtained with enhanced integrator!

```
=====
*** End of Report ***
```

EO Outlet Pre-Cal 12.8ppm

```
=====
Injection Date   : 7/14/2016 1:12:58 PM
Sample Name     : Pre-Cal 12.8                Location  : Vial 1
Acq. Operator   : JCH
Acq. Instrument : Instrument 1                Inj Volume: External
Method          : C:\HPCHEM\1\METHODS\ETHYDUAL.M
Last changed    : 7/2/2015 1:34:02 PM by JCH
ethylene oxide dual
```



```
=====
                          Area Percent Report
=====
```

```
Sorted By           :      Signal
Multiplier          :      1.0000
Dilution            :      1.0000
Use Multiplier & Dilution Factor with ISTDs
```

Signal 1: FID1 A,

Peak #	RetTime [min]	Type	Width [min]	Area counts*s	Height [counts]	Area %
1	1.358	MM	0.0829	2.41125e4	4850.24561	1.000e2

```
Totals :                2.41125e4  4850.24561
```

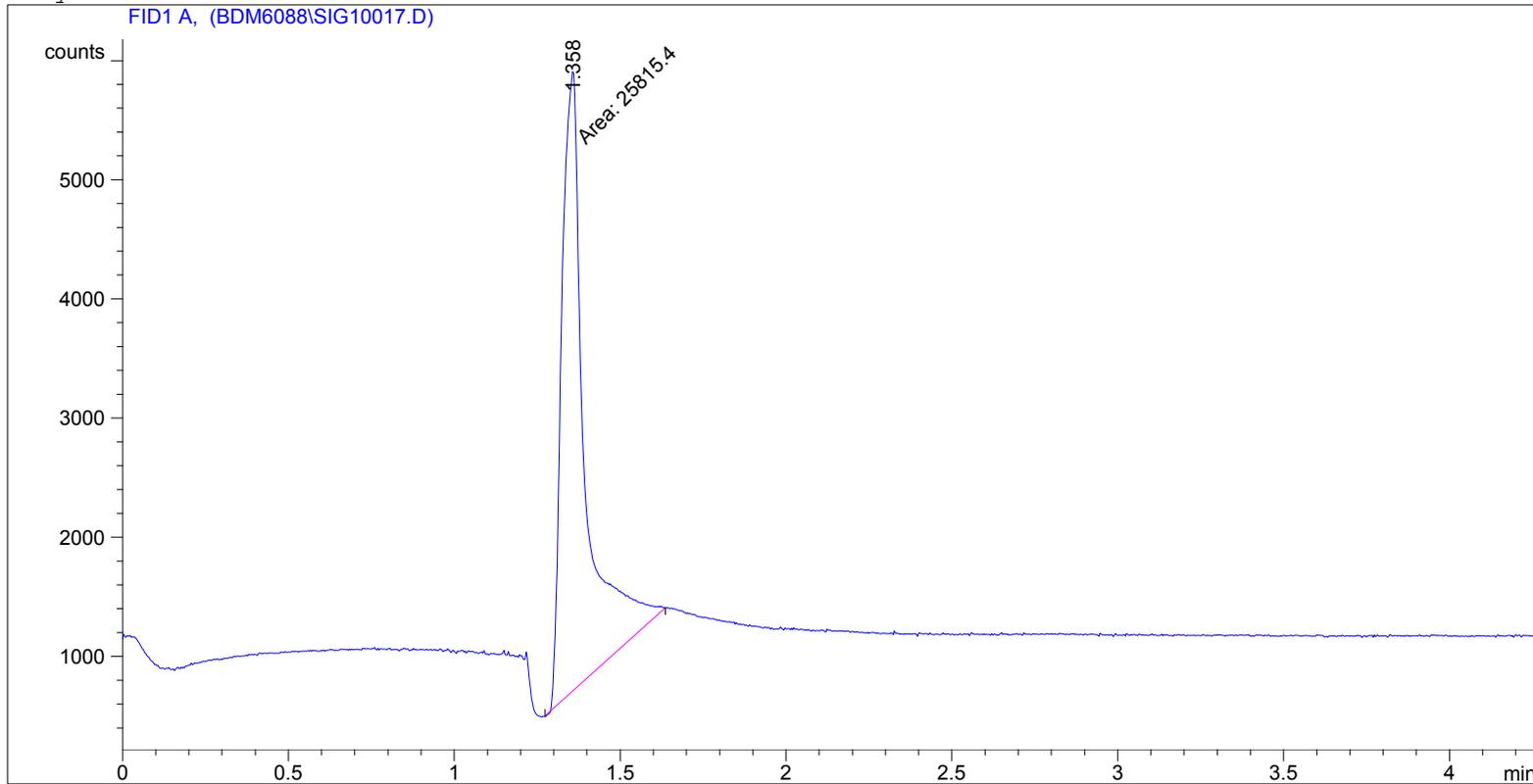
Results obtained with enhanced integrator!

```
=====
*** End of Report ***
```

EO Outlet Pre-Cal 12.8ppm

```

=====
Injection Date   : 7/14/2016 1:16:33 PM
Sample Name     : Pre-Cal 12.8                Location  : Vial 1
Acq. Operator   : JCH
Acq. Instrument : Instrument 1                Inj Volume: External
Method          : C:\HPCHEM\1\METHODS\ETHYDUAL.M
Last changed    : 7/2/2015 1:34:02 PM by JCH
ethylene oxide dual
  
```



```

=====
                          Area Percent Report
=====
  
```

```

Sorted By           :      Signal
Multiplier          :      1.0000
Dilution           :      1.0000
Use Multiplier & Dilution Factor with ISTDs
  
```

Signal 1: FID1 A,

Peak #	RetTime [min]	Type	Width [min]	Area counts*s	Height [counts]	Area %
1	1.358	MM	0.0826	2.58154e4	5208.38428	1.000e2

```
Totals :                2.58154e4  5208.38428
```

Results obtained with enhanced integrator!

```

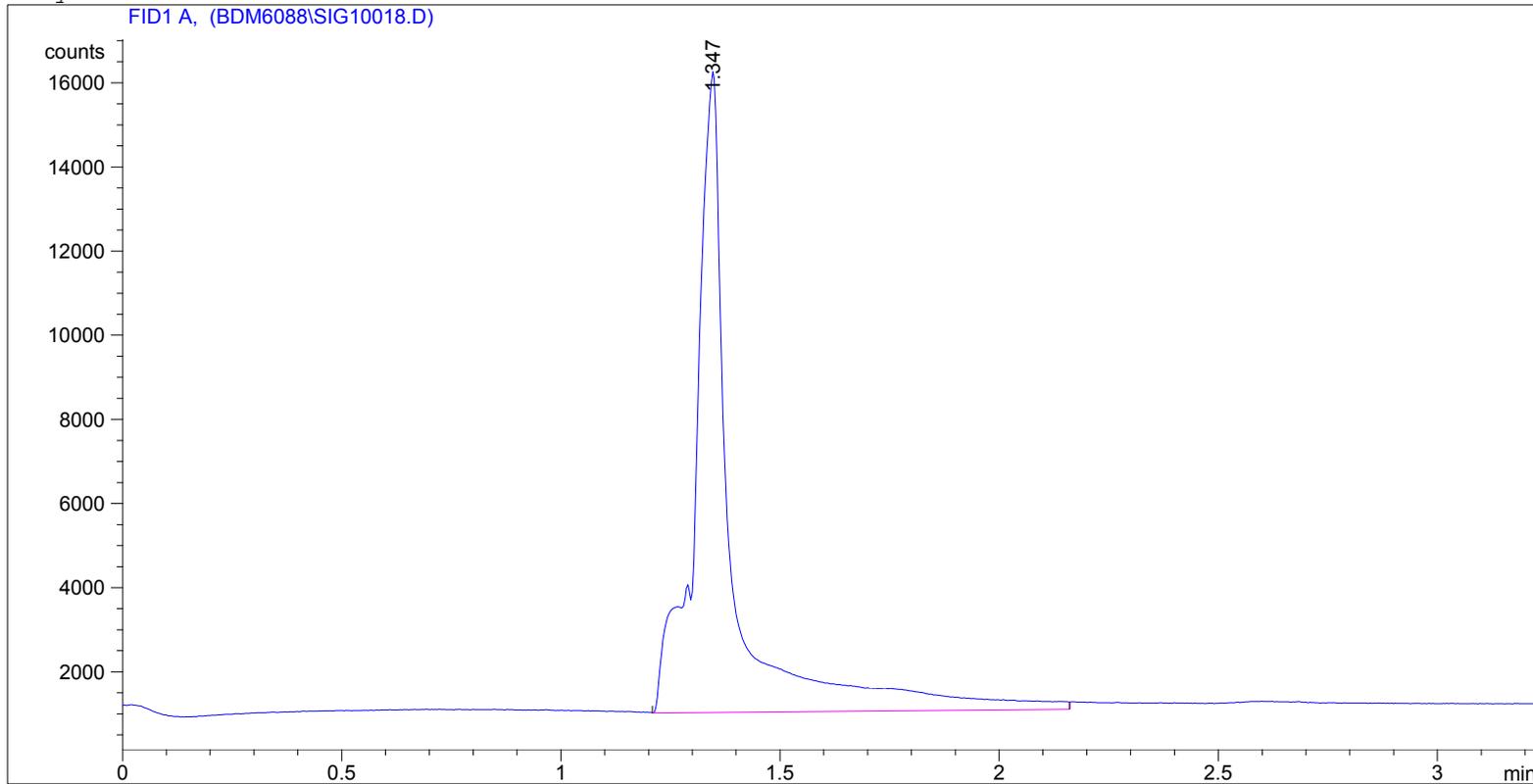
=====
*** End of Report ***
  
```

EO Outlet Line Loss 50.5ppm

```

=====
Injection Date   : 7/14/2016 1:48:06 PM
Sample Name     : Line Loss 51.5           Location  : Vial 1
Acq. Operator   : JCH
Acq. Instrument : Instrument 1             Inj Volume: External
Method          : C:\HPCHEM\1\METHODS\ETHYDUAL.M
Last changed    : 7/2/2015 1:34:02 PM by JCH
ethylene oxide dual

```



```

=====
                          Area Percent Report
=====

```

```

Sorted By           :      Signal
Multiplier          :      1.0000
Dilution            :      1.0000
Use Multiplier & Dilution Factor with ISTDs

```

Signal 1: FID1 A,

Peak #	RetTime [min]	Type	Width [min]	Area counts*s	Height [counts]	Area %
1	1.347	VV	0.0824	8.93184e4	1.52334e4	1.000e2

```
Totals :                8.93184e4  1.52334e4
```

Results obtained with enhanced integrator!

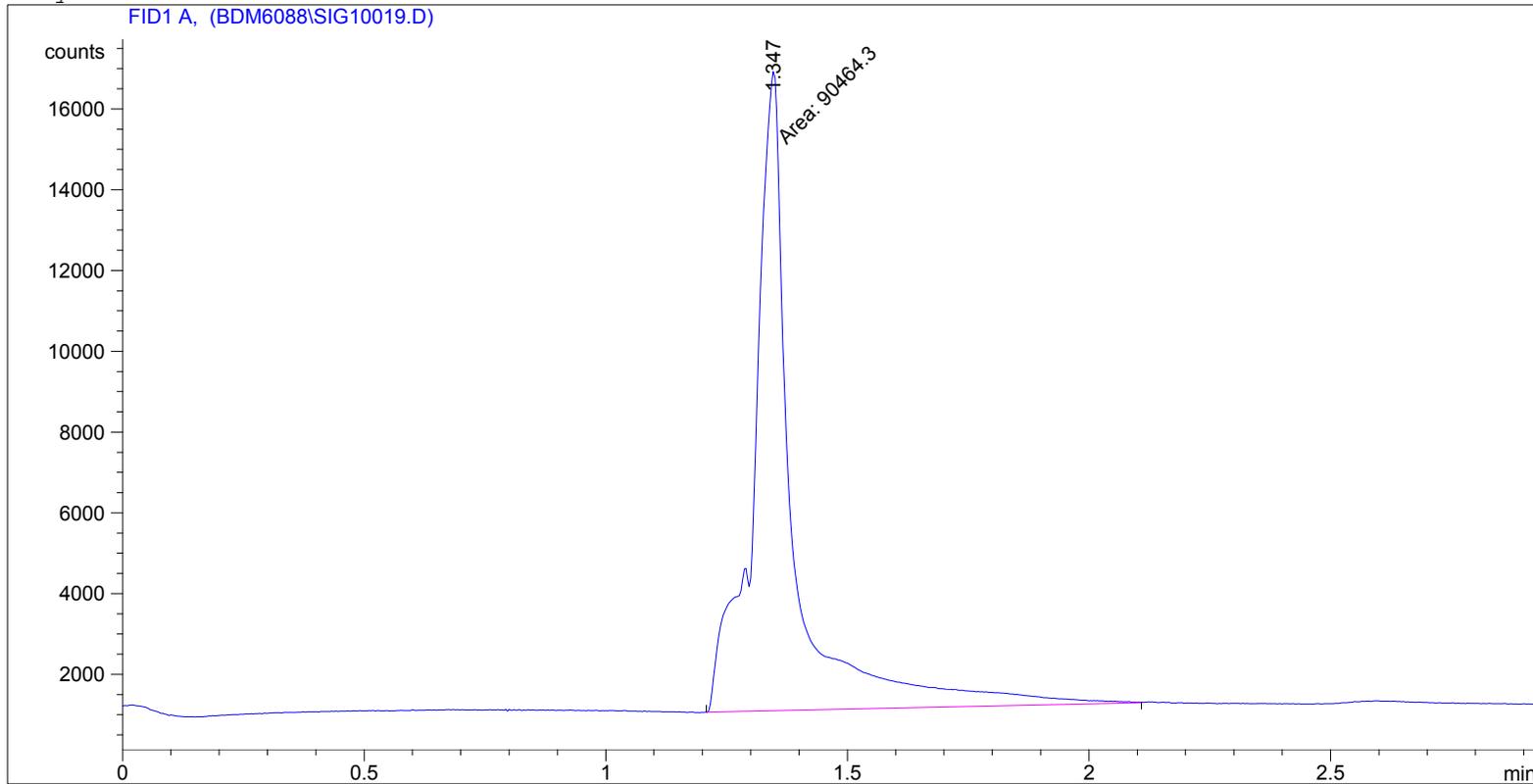
```

=====
*** End of Report ***

```

EO Outlet Line Loss 50.5ppm

```
=====
Injection Date   : 7/14/2016 1:55:41 PM
Sample Name     : Line Loss 51.5           Location  : Vial 1
Acq. Operator   : JCH
Acq. Instrument : Instrument 1             Inj Volume: External
Method          : C:\HPCHEM\1\METHODS\ETHYDUAL.M
Last changed    : 7/2/2015 1:34:02 PM by JCH
ethylene oxide dual
```



```
=====
                          Area Percent Report
=====
```

```
Sorted By           :      Signal
Multiplier          :      1.0000
Dilution            :      1.0000
Use Multiplier & Dilution Factor with ISTDs
```

Signal 1: FID1 A,

Peak #	RetTime [min]	Type	Width [min]	Area counts*s	Height [counts]	Area %
1	1.347	MM	0.0951	9.04643e4	1.58513e4	1.000e2

```
Totals :                9.04643e4  1.58513e4
```

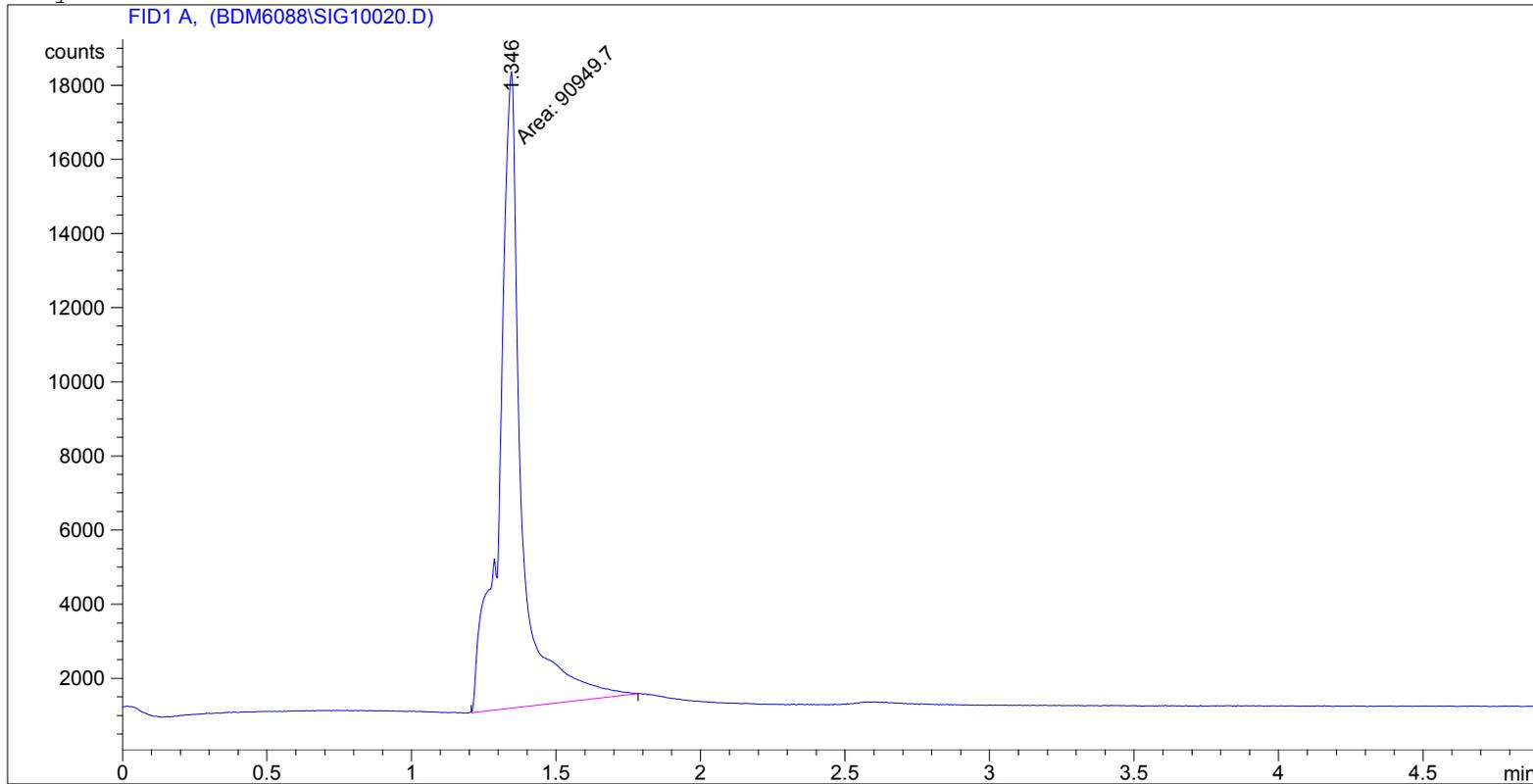
Results obtained with enhanced integrator!

```
=====
*** End of Report ***
```

EO Outlet Line Loss 50.5ppm

```

=====
Injection Date   : 7/14/2016 1:59:17 PM
Sample Name     : Line Loss 51.5           Location  : Vial 1
Acq. Operator  : JCH
Acq. Instrument : Instrument 1             Inj Volume: External
Method         : C:\HPCHEM\1\METHODS\ETHYDUAL.M
Last changed   : 7/2/2015 1:34:02 PM by JCH
ethylene oxide dual
  
```



```

=====
                          Area Percent Report
=====
  
```

```

Sorted By           :      Signal
Multiplier          :      1.0000
Dilution            :      1.0000
Use Multiplier & Dilution Factor with ISTDs
  
```

Signal 1: FID1 A,

Peak #	RetTime [min]	Type	Width [min]	Area counts*s	Height [counts]	Area %
1	1.346	MM	0.0881	9.09497e4	1.72149e4	1.000e2

```
Totals :                9.09497e4  1.72149e4
```

Results obtained with enhanced integrator!

```

=====
*** End of Report ***
  
```

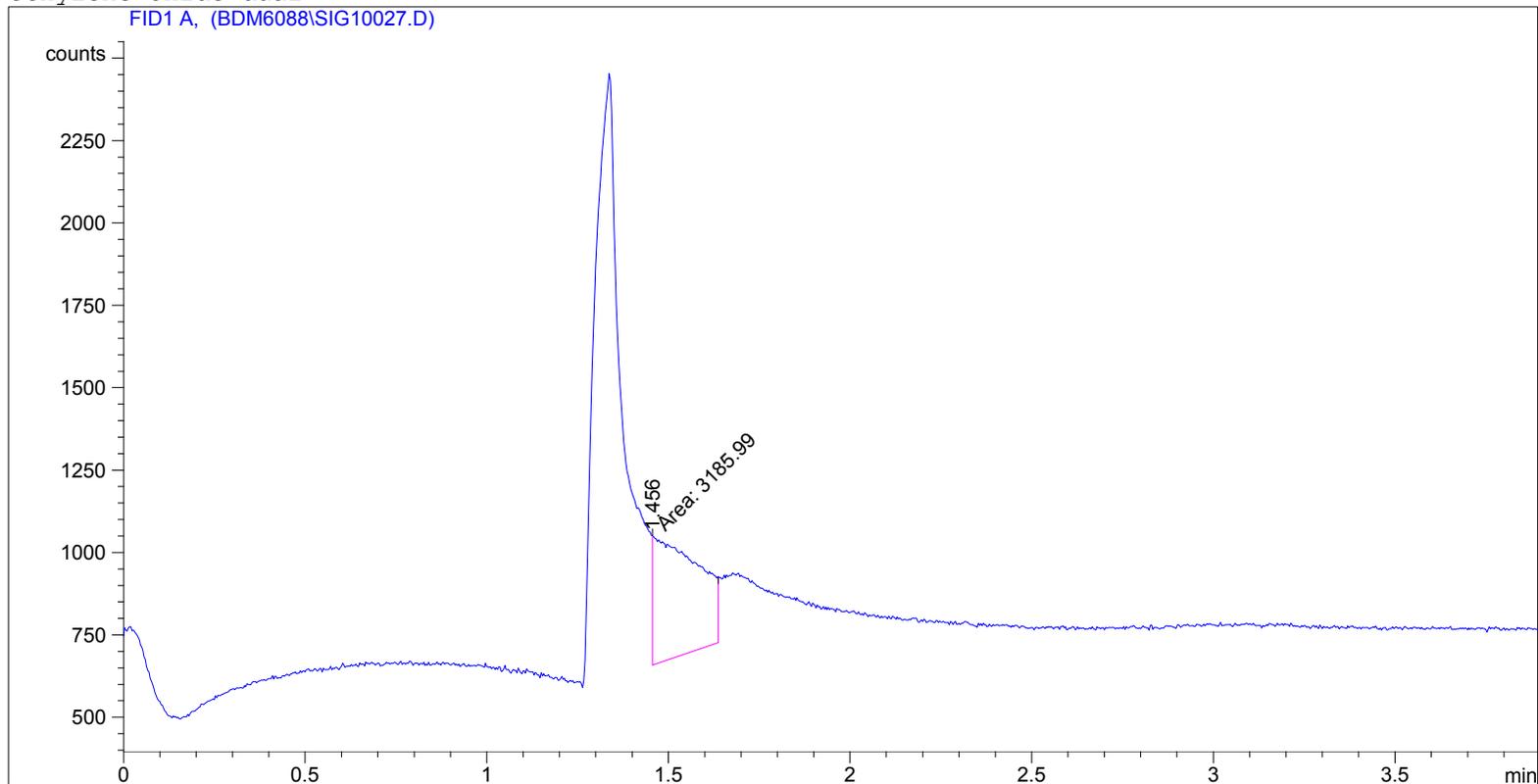
## **Outlet Runs**

EO Outlet Run 1, Inj 1

```

=====
Injection Date   : 7/15/2016 8:48:22 AM
Sample Name     : Outlet Run 1                Location  : Vial 1
Acq. Operator  : JCH
Acq. Instrument : Instrument 1                Inj Volume : External
Method         : C:\HPCHEM\1\METHODS\ETHYDUAL.M
Last changed   : 7/2/2015 1:34:02 PM by JCH
ethylene oxide dual

```



```

=====
                          Area Percent Report
=====

```

```

Sorted By           :      Signal
Multiplier          :      1.0000
Dilution            :      1.0000
Use Multiplier & Dilution Factor with ISTDs

```

Signal 1: FID1 A,

Peak #	RetTime [min]	Type	Width [min]	Area counts*s	Height [counts]	Area %
1	1.456	MF	0.1354	3185.98560	392.19827	1.000e2

```
Totals :                3185.98560  392.19827
```

Results obtained with enhanced integrator!

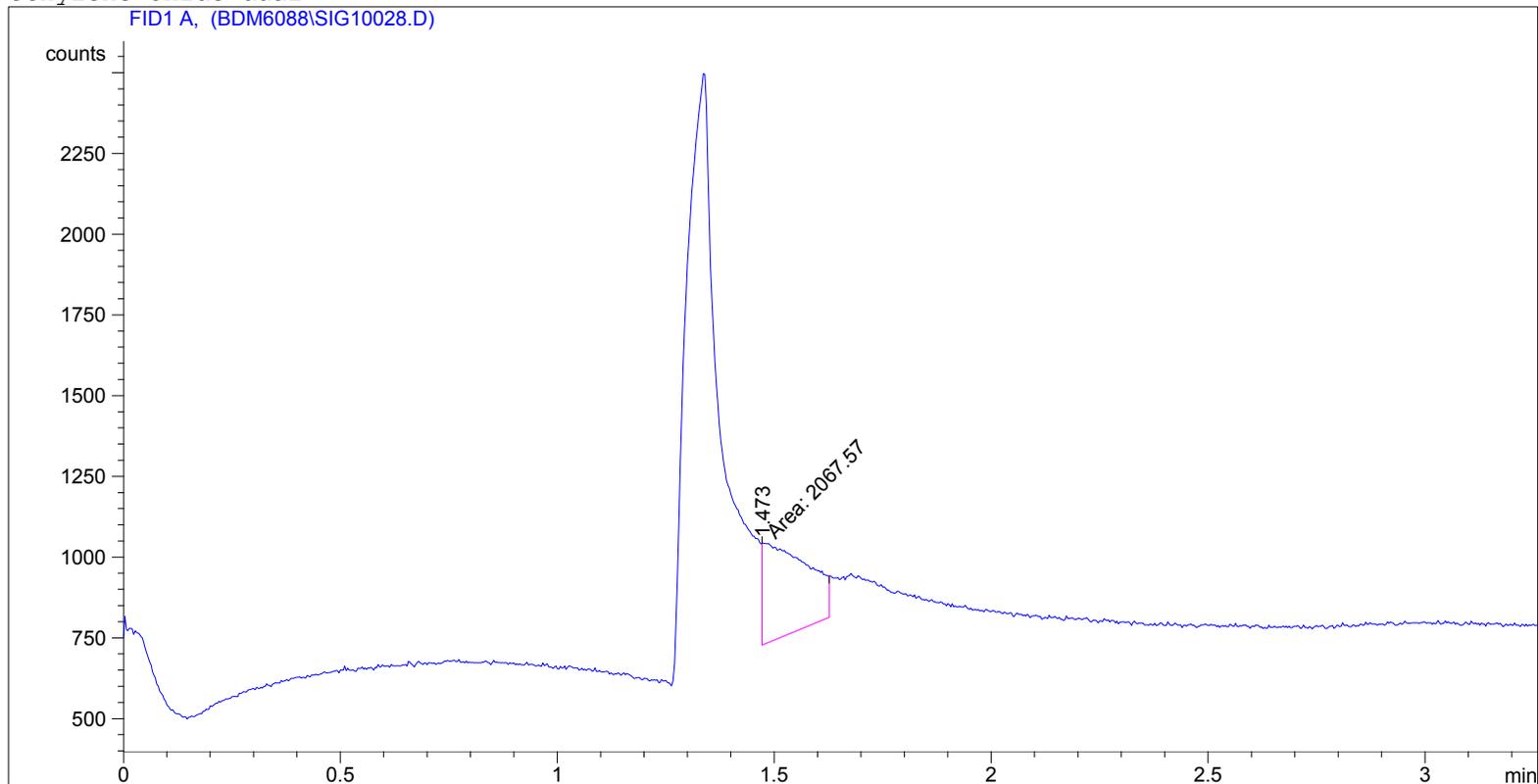
```

=====
*** End of Report ***

```

EO Outlet Run 1, Inj 2

```
=====
Injection Date   : 7/15/2016 8:57:23 AM
Sample Name     : Outlet Run 1           Location  : Vial 1
Acq. Operator   : JCH
Acq. Instrument : Instrument 1          Inj Volume: External
Method          : C:\HPCHEM\1\METHODS\ETHYDUAL.M
Last changed    : 7/2/2015 1:34:02 PM by JCH
ethylene oxide dual
```



```
=====
Area Percent Report
=====
```

```
Sorted By      :      Signal
Multiplier     :      1.0000
Dilution       :      1.0000
Use Multiplier & Dilution Factor with ISTDs
```

Signal 1: FID1 A,

Peak #	RetTime [min]	Type	Width [min]	Area counts*s	Height [counts]	Area %
1	1.473	MF	0.1091	2067.56543	315.81375	1.000e2

```
Totals :                2067.56543  315.81375
```

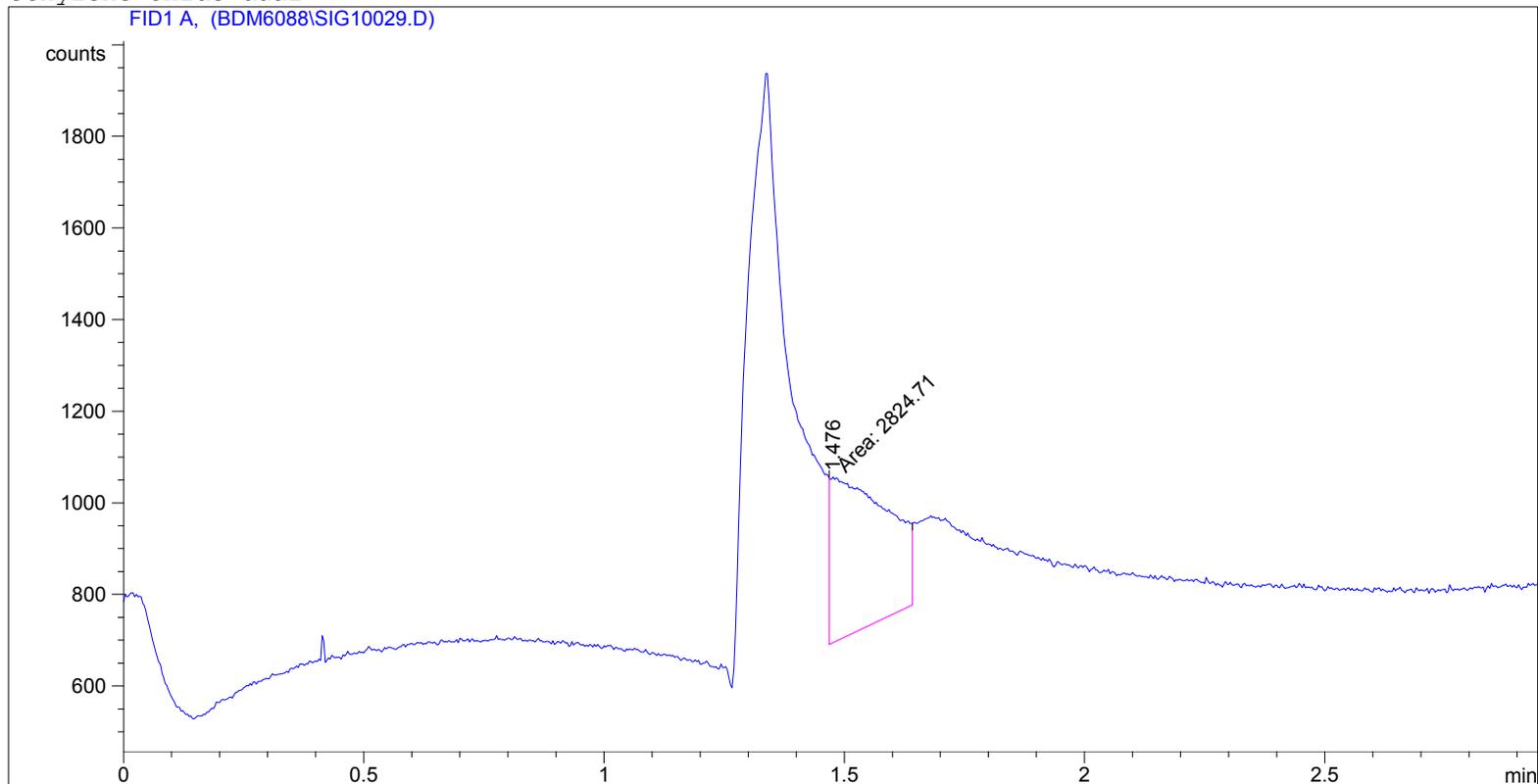
Results obtained with enhanced integrator!

```
=====
*** End of Report ***
```

EO Outlet Run 1, Inj 3

```

=====
Injection Date   : 7/15/2016 9:14:17 AM
Sample Name     : Outlet Run 1                Location  : Vial 1
Acq. Operator   : JCH
Acq. Instrument : Instrument 1                Inj Volume: External
Method          : C:\HPCHEM\1\METHODS\ETHYDUAL.M
Last changed    : 7/2/2015 1:34:02 PM by JCH
ethylene oxide dual
  
```



```

=====
                          Area Percent Report
=====
  
```

```

Sorted By           :      Signal
Multiplier          :      1.0000
Dilution            :      1.0000
Use Multiplier & Dilution Factor with ISTDs
  
```

Signal 1: FID1 A,

Peak #	RetTime [min]	Type	Width [min]	Area counts*s	Height [counts]	Area %
1	1.476	MF	0.1300	2824.71265	362.24652	1.000e2

```
Totals :                2824.71265  362.24652
```

Results obtained with enhanced integrator!

```

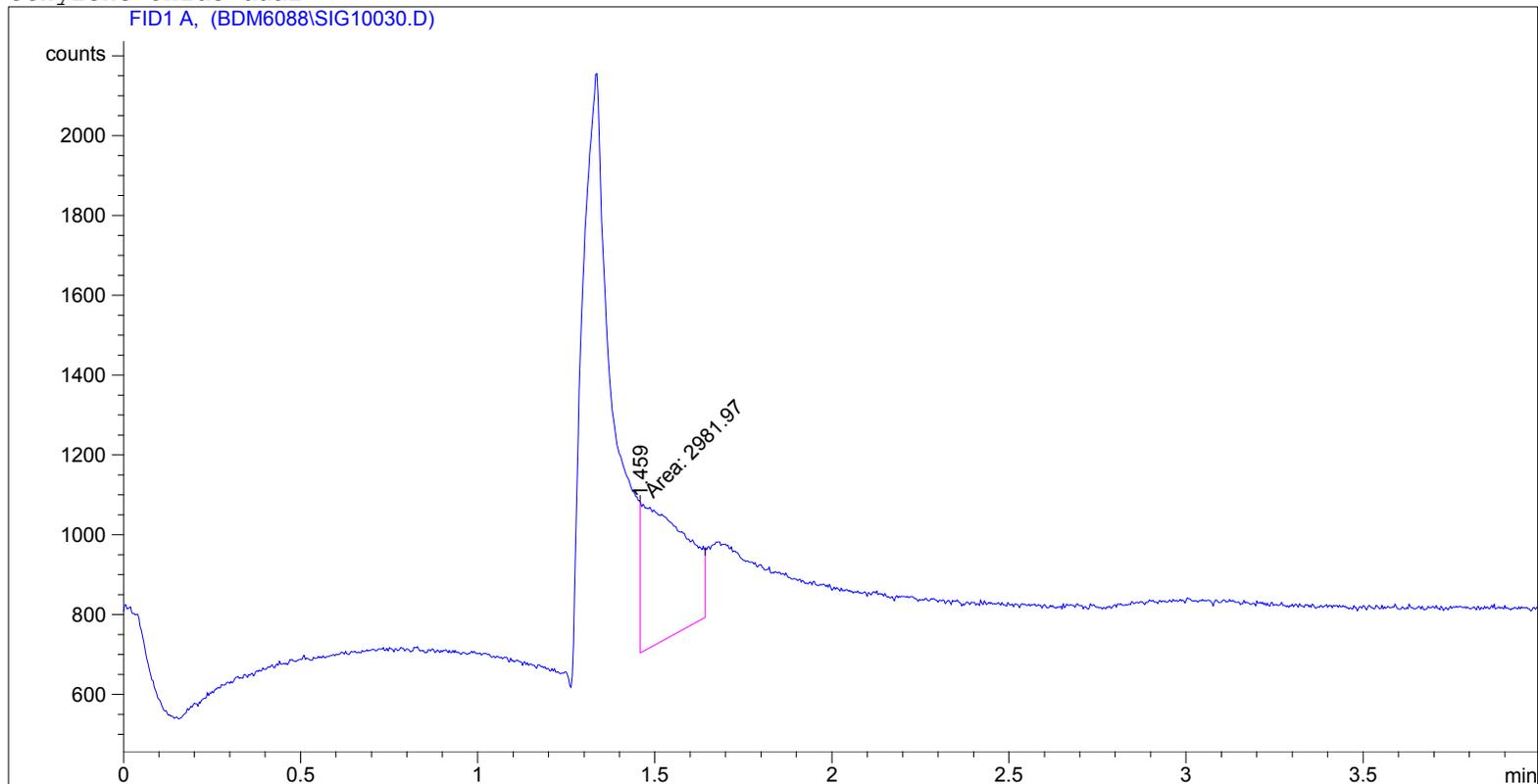
=====
*** End of Report ***
  
```

EO Outlet Run 1, Inj 4

```

=====
Injection Date   : 7/15/2016 9:24:03 AM
Sample Name     : Outlet Run 1                Location  : Vial 1
Acq. Operator   : JCH
Acq. Instrument : Instrument 1                Inj Volume: External
Method          : C:\HPCHEM\1\METHODS\ETHYDUAL.M
Last changed    : 7/2/2015 1:34:02 PM by JCH
ethylene oxide dual

```



```

=====
                          Area Percent Report
=====

```

```

Sorted By           :      Signal
Multiplier          :      1.0000
Dilution            :      1.0000
Use Multiplier & Dilution Factor with ISTDs

```

Signal 1: FID1 A,

Peak #	RetTime [min]	Type	Width [min]	Area counts*s	Height [counts]	Area %
1	1.459	MF	0.1318	2981.97363	377.14899	1.000e2

```
Totals :                2981.97363  377.14899
```

Results obtained with enhanced integrator!

```

=====
*** End of Report ***

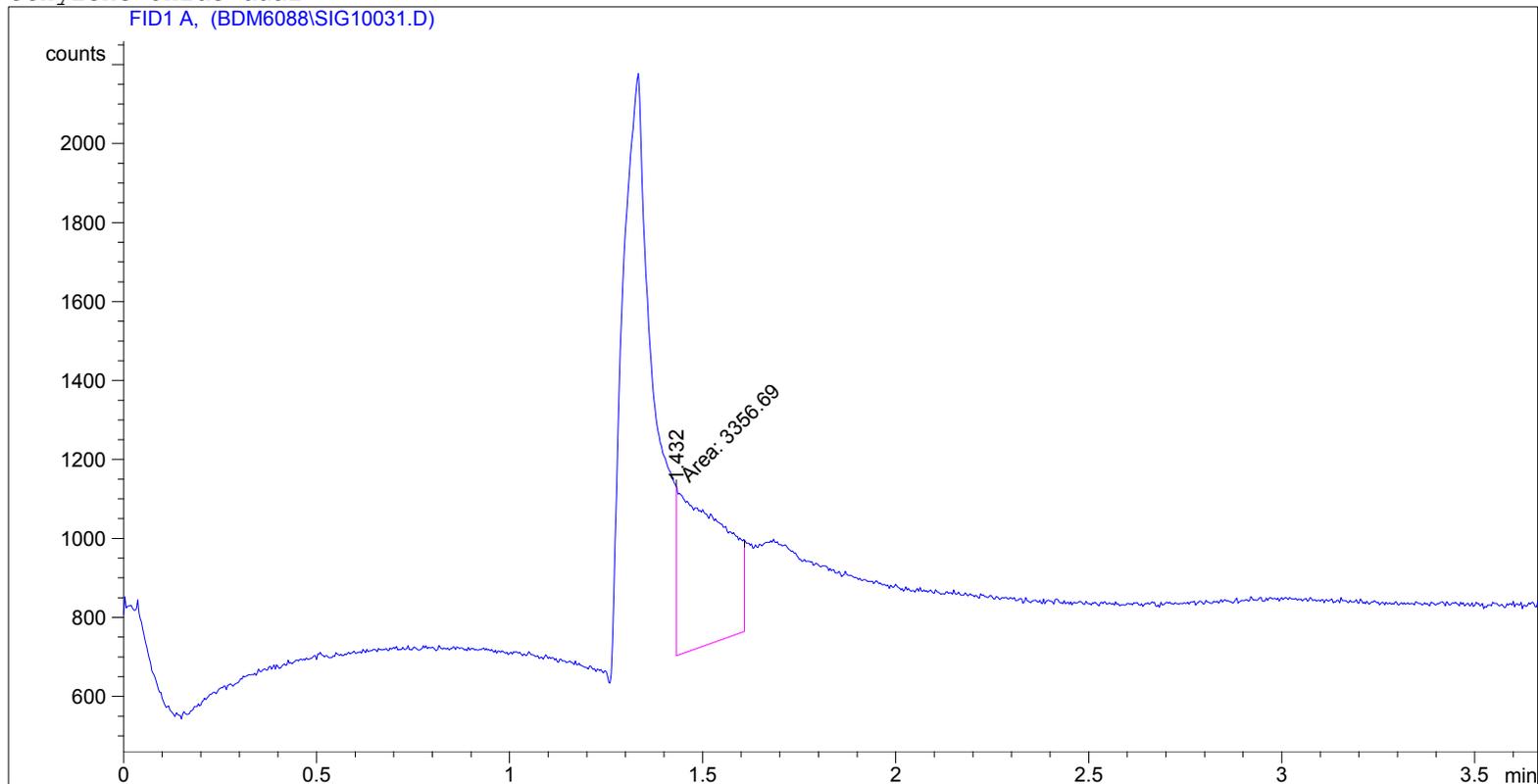
```

EO Outlet Run 1, Inj 5

```

=====
Injection Date   : 7/15/2016 9:33:51 AM
Sample Name     : Outlet Run 1                Location  : Vial 1
Acq. Operator   : JCH
Acq. Instrument : Instrument 1                Inj Volume: External
Method          : C:\HPCHEM\1\METHODS\ETHYDUAL.M
Last changed    : 7/2/2015 1:34:02 PM by JCH
ethylene oxide dual

```



```

=====
                          Area Percent Report
=====

```

```

Sorted By           :      Signal
Multiplier          :      1.0000
Dilution            :      1.0000
Use Multiplier & Dilution Factor with ISTDs

```

Signal 1: FID1 A,

Peak #	RetTime [min]	Type	Width [min]	Area counts*s	Height [counts]	Area %
1	1.432	MF	0.1307	3356.68945	428.10312	1.000e2

```
Totals :                3356.68945  428.10312
```

Results obtained with enhanced integrator!

```

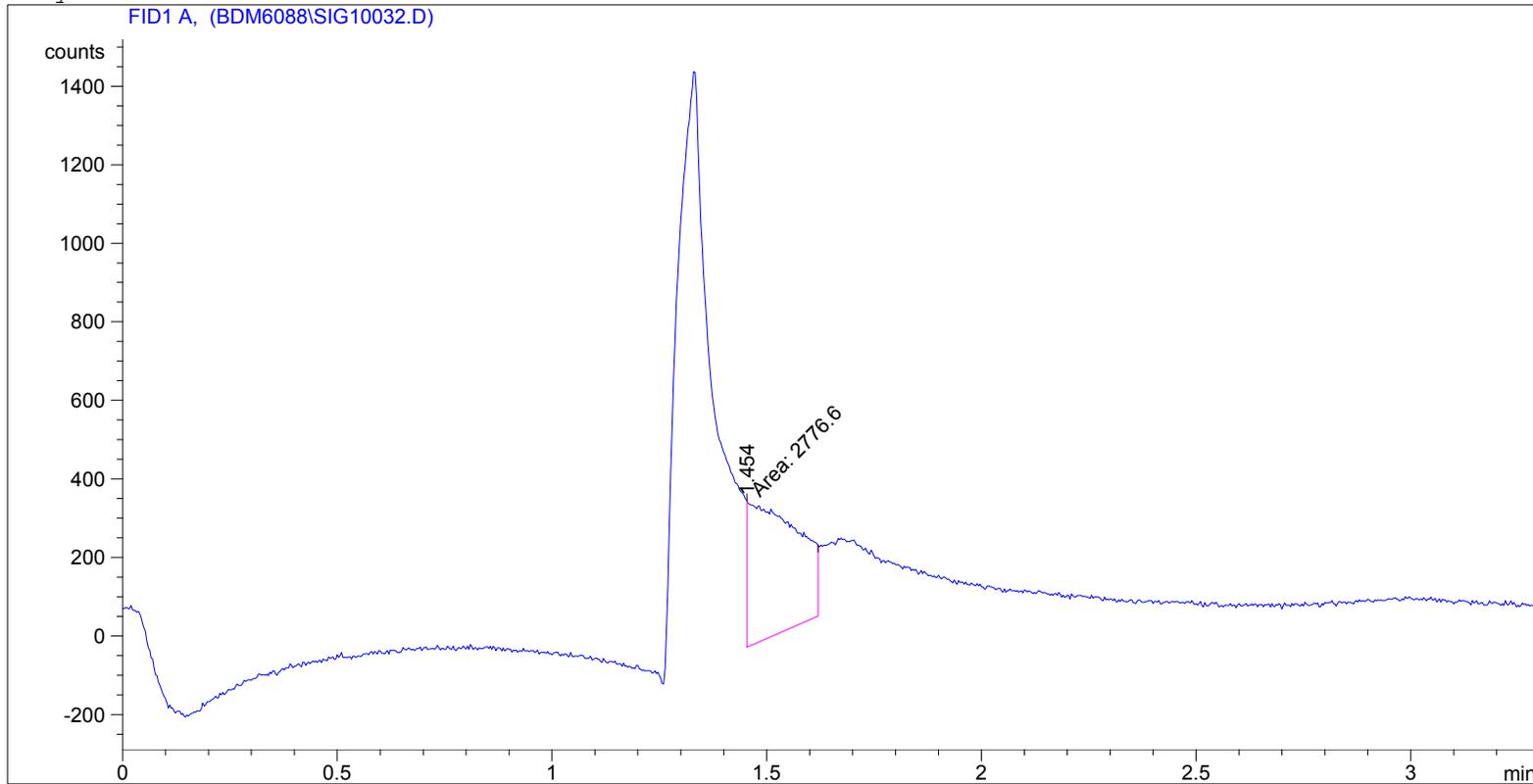
=====
*** End of Report ***

```

EO Outlet Run 2, Inj 1

```

=====
Injection Date   : 7/15/2016 9:53:57 AM
Sample Name     : Outlet Run 2                Location  : Vial 1
Acq. Operator   : JCH
Acq. Instrument : Instrument 1                Inj Volume: External
Method          : C:\HPCHEM\1\METHODS\ETHYDUAL.M
Last changed    : 7/2/2015 1:34:02 PM by JCH
ethylene oxide dual
  
```



```

=====
                          Area Percent Report
=====
  
```

```

Sorted By           :      Signal
Multiplier          :      1.0000
Dilution            :      1.0000
Use Multiplier & Dilution Factor with ISTDs
  
```

Signal 1: FID1 A,

Peak #	RetTime [min]	Type	Width [min]	Area counts*s	Height [counts]	Area %
1	1.454	MF	0.1240	2776.59937	373.26871	1.000e2

```
Totals :                2776.59937  373.26871
```

Results obtained with enhanced integrator!

```

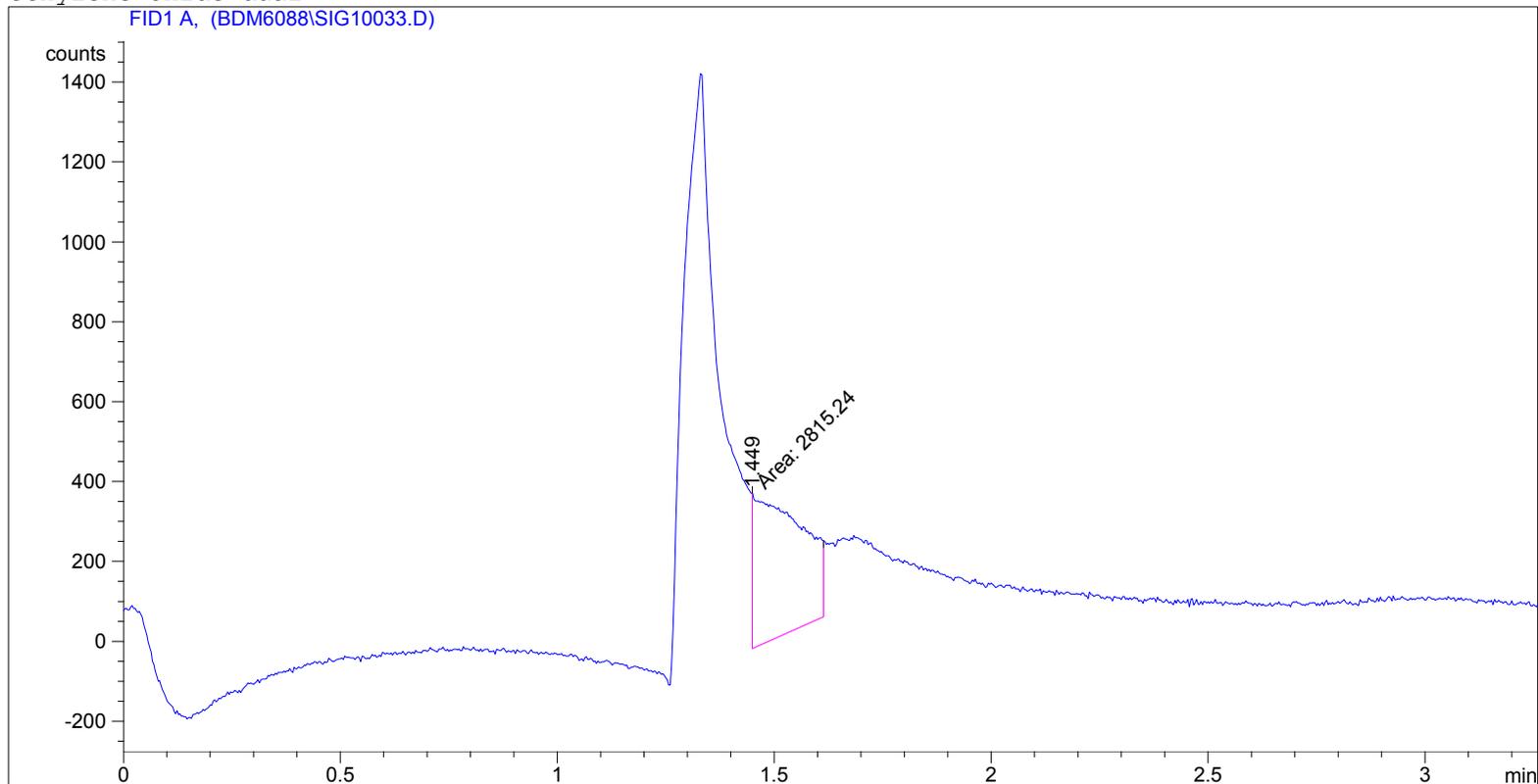
=====
*** End of Report ***
  
```

EO Outlet Run 2, Inj 2

```

=====
Injection Date   : 7/15/2016 10:05:04 AM
Sample Name     : Outlet Run 2                Location  : Vial 1
Acq. Operator   : JCH
Acq. Instrument : Instrument 1                Inj Volume: External
Method          : C:\HPCHEM\1\METHODS\ETHYDUAL.M
Last changed    : 7/2/2015 1:34:02 PM by JCH
ethylene oxide dual

```



```

=====
                          Area Percent Report
=====

```

```

Sorted By           :      Signal
Multiplier          :      1.0000
Dilution            :      1.0000
Use Multiplier & Dilution Factor with ISTDs

```

Signal 1: FID1 A,

Peak #	RetTime [min]	Type	Width [min]	Area counts*s	Height [counts]	Area %
1	1.449	MF	0.0869	2815.23828	388.58289	1.000e2

```
Totals :                2815.23828  388.58289
```

Results obtained with enhanced integrator!

```

=====
*** End of Report ***

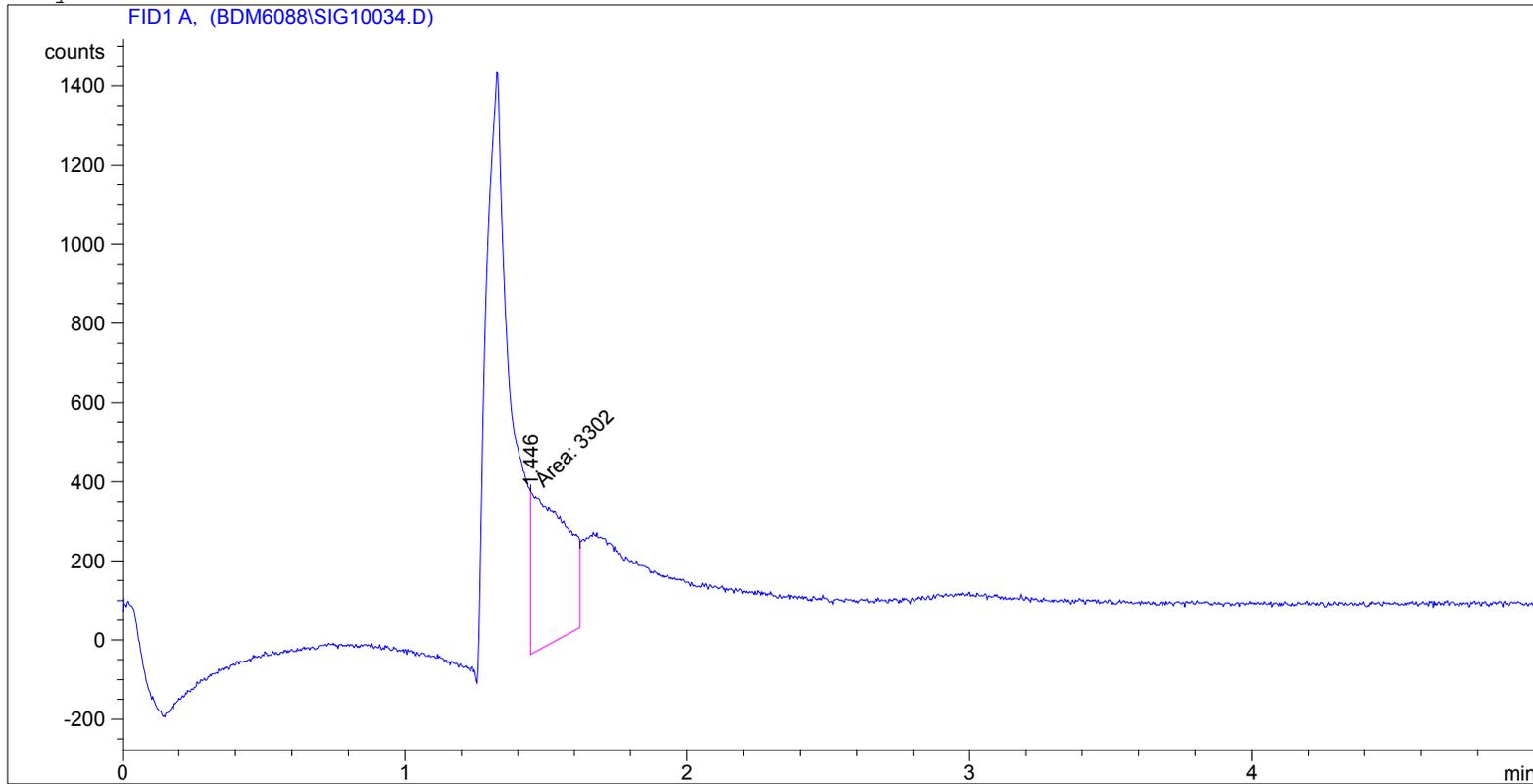
```

EO Outlet Run 2, Inj 3

```

=====
Injection Date   : 7/15/2016 10:19:40 AM
Sample Name     : Outlet Run 2                Location  : Vial 1
Acq. Operator   : JCH
Acq. Instrument : Instrument 1                Inj Volume: External
Method          : C:\HPCHEM\1\METHODS\ETHYDUAL.M
Last changed    : 7/2/2015 1:34:02 PM by JCH
ethylene oxide dual

```



```

=====
                          Area Percent Report
=====

```

```

Sorted By           :      Signal
Multiplier          :      1.0000
Dilution            :      1.0000
Use Multiplier & Dilution Factor with ISTDs

```

Signal 1: FID1 A,

Peak #	RetTime [min]	Type	Width [min]	Area counts*s	Height [counts]	Area %
1	1.446	MF	0.0941	3302.00269	411.41562	1.000e2

```
Totals :                3302.00269  411.41562
```

Results obtained with enhanced integrator!

```

=====
*** End of Report ***

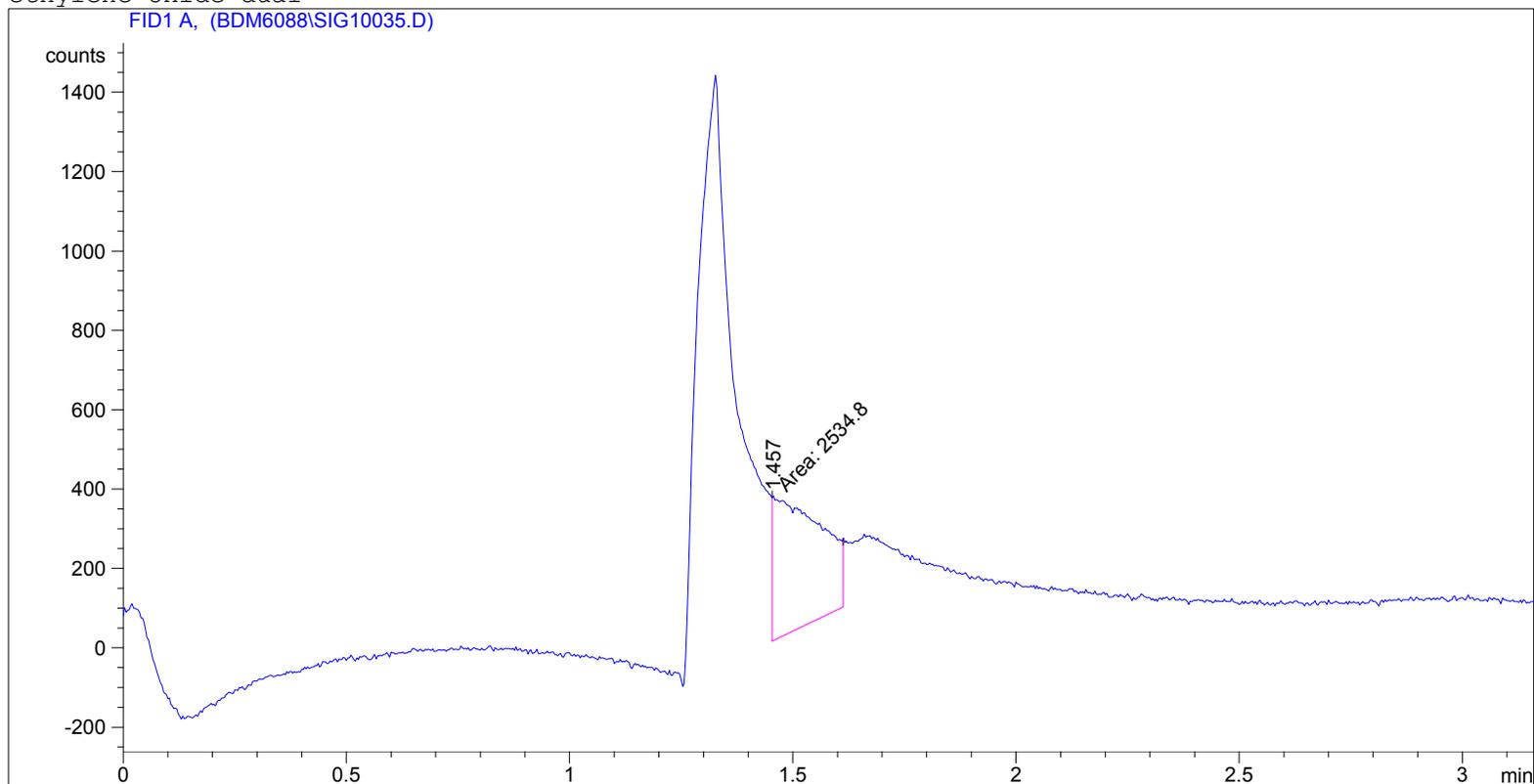
```

EO Outlet Run 2, Inj 4

```

=====
Injection Date   : 7/15/2016 10:31:31 AM
Sample Name     : Outlet Run 2                Location  : Vial 1
Acq. Operator   : JCH
Acq. Instrument : Instrument 1                Inj Volume: External
Method          : C:\HPCHEM\1\METHODS\ETHYDUAL.M
Last changed    : 7/2/2015 1:34:02 PM by JCH
ethylene oxide dual

```



```

=====
                          Area Percent Report
=====

```

```

Sorted By           :      Signal
Multiplier          :      1.0000
Dilution            :      1.0000
Use Multiplier & Dilution Factor with ISTDs

```

Signal 1: FID1 A,

Peak #	RetTime [min]	Type	Width [min]	Area counts*s	Height [counts]	Area %
1	1.457	MF	0.1160	2534.79688	364.09836	1.000e2

```
Totals :                2534.79688  364.09836
```

Results obtained with enhanced integrator!

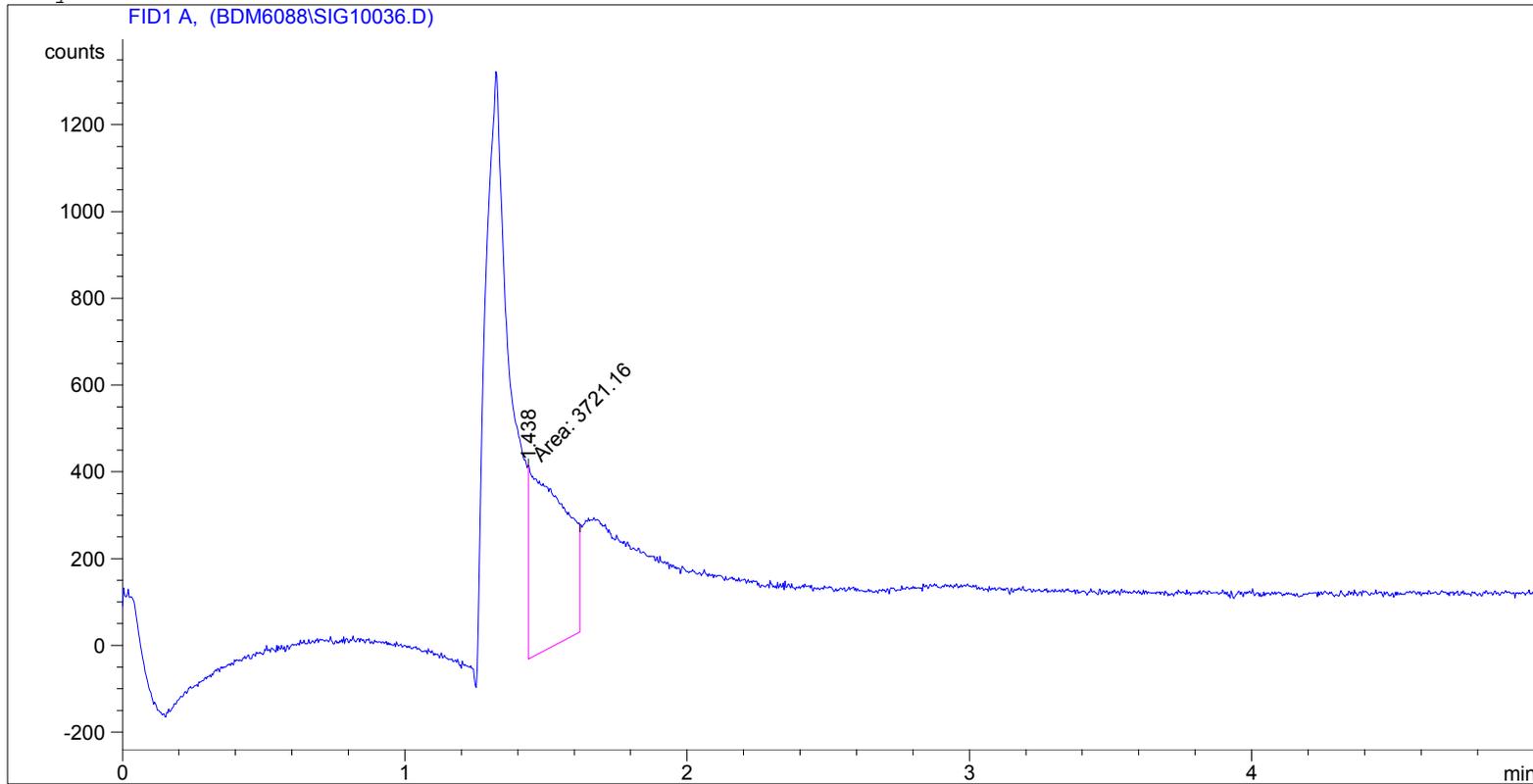
```

=====
*** End of Report ***

```

EO Outlet Run 2, Inj 5

```
=====
Injection Date   : 7/15/2016 10:44:40 AM
Sample Name     : Outlet Run 2                Location  : Vial 1
Acq. Operator  : JCH
Acq. Instrument : Instrument 1              Inj Volume: External
Method         : C:\HPCHEM\1\METHODS\ETHYDUAL.M
Last changed   : 7/2/2015 1:34:02 PM by JCH
ethylene oxide dual
```



```
=====
                          Area Percent Report
=====
```

```
Sorted By           :      Signal
Multiplier          :      1.0000
Dilution            :      1.0000
Use Multiplier & Dilution Factor with ISTDs
```

Signal 1: FID1 A,

Peak #	RetTime [min]	Type	Width [min]	Area counts*s	Height [counts]	Area %
1	1.438	MF	0.1391	3721.15991	446.00540	1.000e2

```
Totals :                3721.15991  446.00540
```

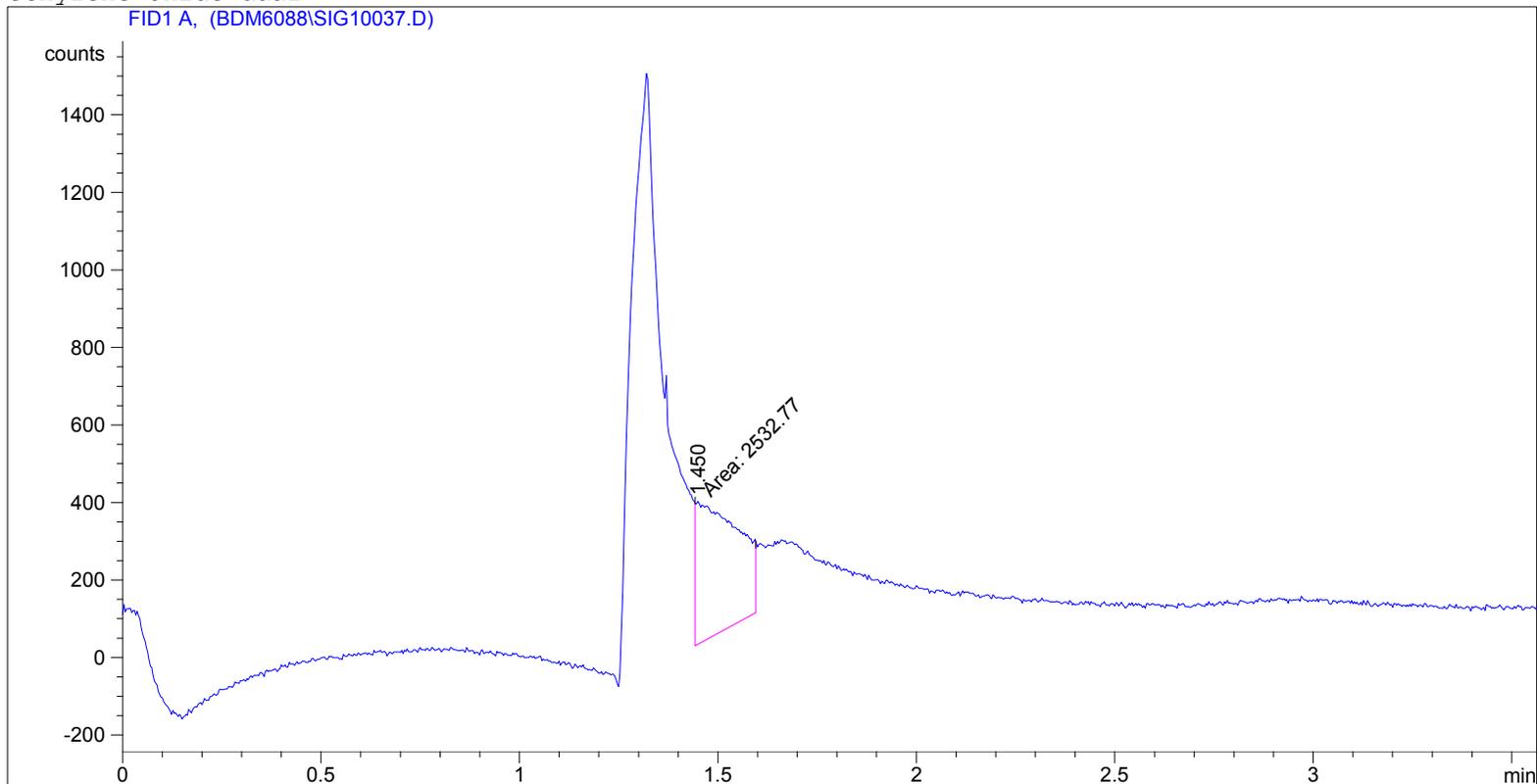
Results obtained with enhanced integrator!

```
=====
*** End of Report ***
```

EO Outlet Run 3, Inj 1

```

=====
Injection Date   : 7/15/2016 11:00:54 AM
Sample Name     : Outlet Run 2                Location  : Vial 1
Acq. Operator   : JCH
Acq. Instrument : Instrument 1                Inj Volume: External
Method          : C:\HPCHEM\1\METHODS\ETHYDUAL.M
Last changed    : 7/2/2015 1:34:02 PM by JCH
ethylene oxide dual
  
```



```

=====
                          Area Percent Report
=====
  
```

```

Sorted By           :      Signal
Multiplier          :      1.0000
Dilution            :      1.0000
Use Multiplier & Dilution Factor with ISTDs
  
```

Signal 1: FID1 A,

Peak #	RetTime [min]	Type	Width [min]	Area counts*s	Height [counts]	Area %
1	1.450	MF	0.1142	2532.77002	369.53870	1.000e2

```
Totals :                2532.77002  369.53870
```

Results obtained with enhanced integrator!

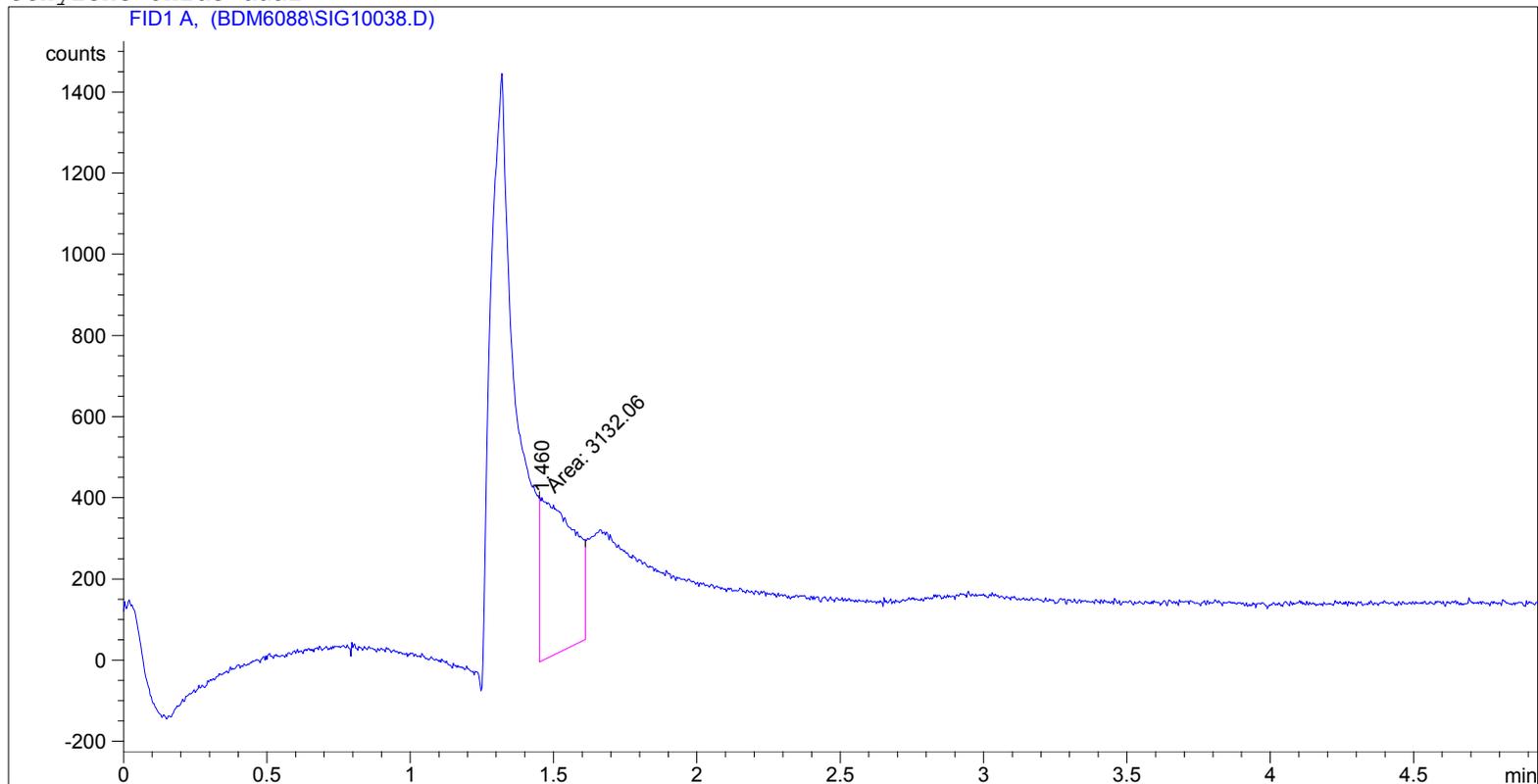
```

=====
*** End of Report ***
  
```

EO Outlet Run 3, Inj 2

```

=====
Injection Date   : 7/15/2016 11:16:14 AM
Sample Name     : Outlet Run 3                Location  : Vial 1
Acq. Operator   : JCH
Acq. Instrument : Instrument 1                Inj Volume: External
Method          : C:\HPCHEM\1\METHODS\ETHYDUAL.M
Last changed    : 7/2/2015 1:34:02 PM by JCH
ethylene oxide dual
  
```



```

=====
                          Area Percent Report
=====
  
```

```

Sorted By           :      Signal
Multiplier          :      1.0000
Dilution            :      1.0000
Use Multiplier & Dilution Factor with ISTDs
  
```

Signal 1: FID1 A,

Peak #	RetTime [min]	Type	Width [min]	Area counts*s	Height [counts]	Area %
1	1.460	MF	0.1136	3132.05884	402.80652	1.000e2

```
Totals :                3132.05884  402.80652
```

Results obtained with enhanced integrator!

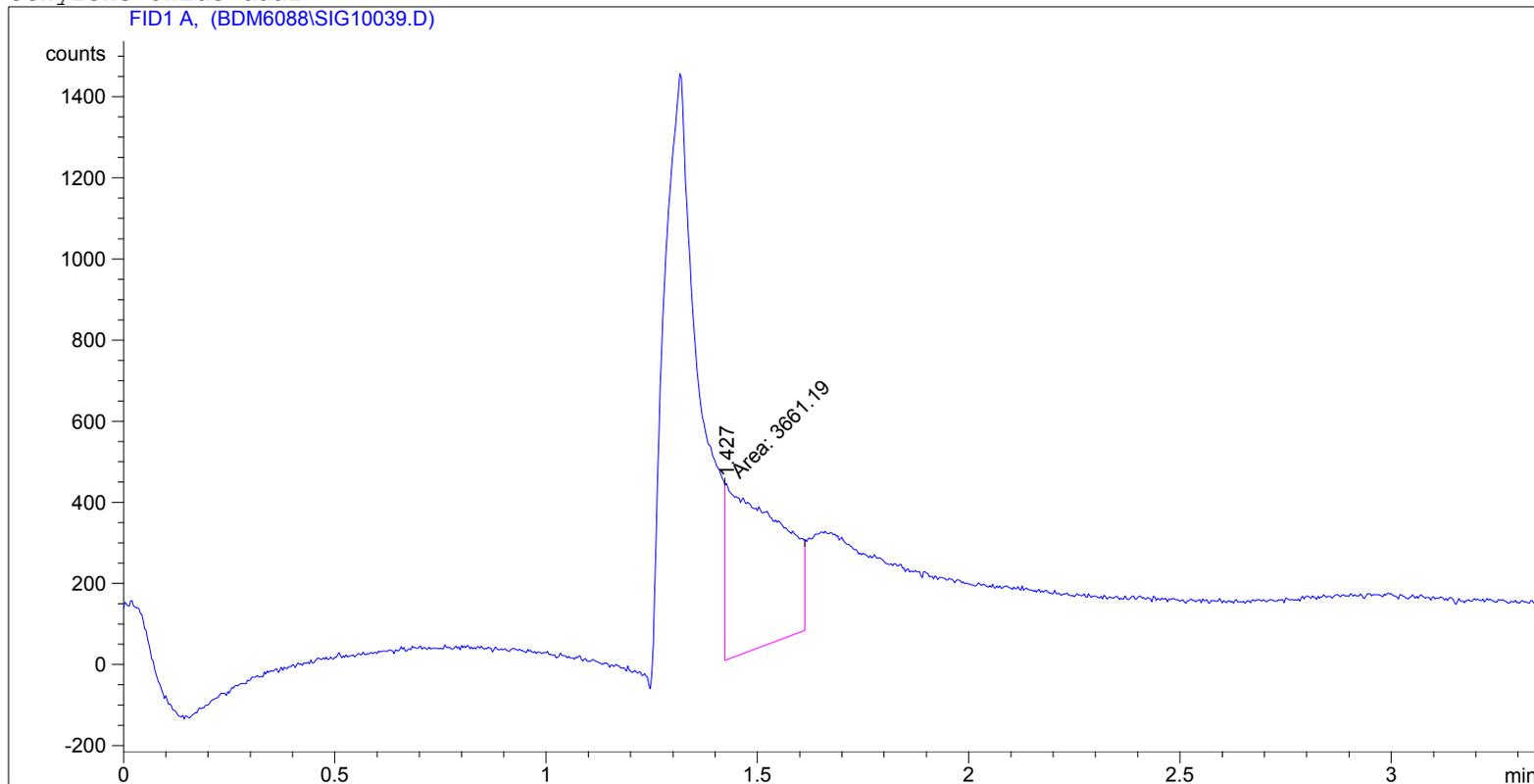
```

=====
*** End of Report ***
  
```

EO Outlet Run 3, Inj 3

```

=====
Injection Date   : 7/15/2016 11:28:48 AM
Sample Name     : Outlet Run 3                Location  : Vial 1
Acq. Operator   : JCH
Acq. Instrument : Instrument 1              Inj Volume: External
Method          : C:\HPCHEM\1\METHODS\ETHYDUAL.M
Last changed    : 7/2/2015 1:34:02 PM by JCH
ethylene oxide dual
  
```



```

=====
                          Area Percent Report
=====
  
```

```

Sorted By           :      Signal
Multiplier          :      1.0000
Dilution            :      1.0000
Use Multiplier & Dilution Factor with ISTDs
  
```

Signal 1: FID1 A,

Peak #	RetTime [min]	Type	Width [min]	Area counts*s	Height [counts]	Area %
1	1.427	MF	0.1395	3661.19336	437.33008	1.000e2

```
Totals :                3661.19336  437.33008
```

Results obtained with enhanced integrator!

```

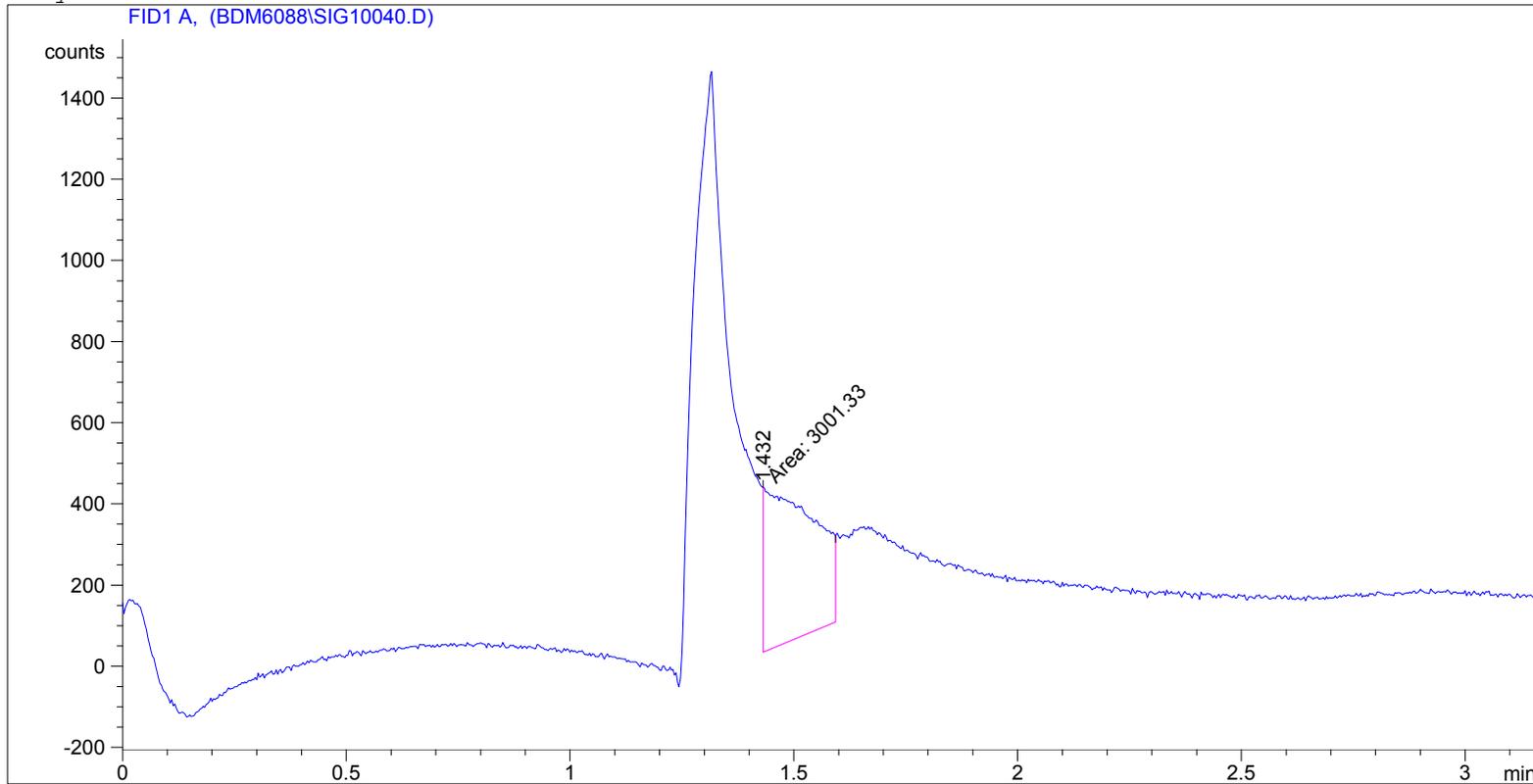
=====
*** End of Report ***
  
```

EO Outlet Run 3, Inj 4

```

=====
Injection Date   : 7/15/2016 11:39:43 AM
Sample Name     : Outlet Run 3                Location  : Vial 1
Acq. Operator   : JCH
Acq. Instrument : Instrument 1                Inj Volume: External
Method          : C:\HPCHEM\1\METHODS\ETHYDUAL.M
Last changed    : 7/2/2015 1:34:02 PM by JCH
ethylene oxide dual

```



```

=====
                          Area Percent Report
=====

```

```

Sorted By           :      Signal
Multiplier          :      1.0000
Dilution            :      1.0000
Use Multiplier & Dilution Factor with ISTDs

```

Signal 1: FID1 A,

Peak #	RetTime [min]	Type	Width [min]	Area counts*s	Height [counts]	Area %
1	1.432	MF	0.0888	3001.33057	406.29553	1.000e2

```
Totals :                3001.33057  406.29553
```

Results obtained with enhanced integrator!

```

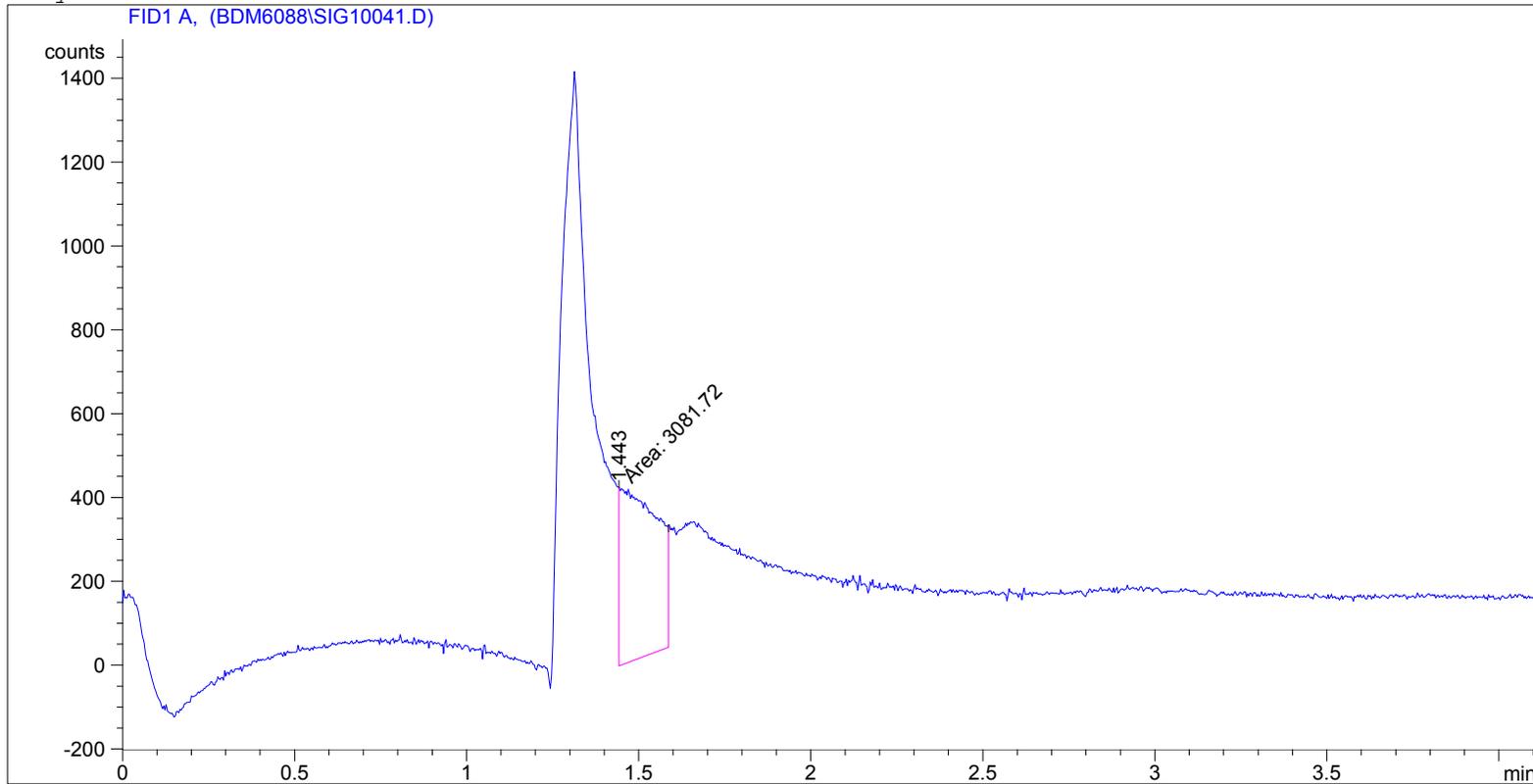
=====
*** End of Report ***

```

EO Outlet Run 3, Inj 5

```

=====
Injection Date   : 7/15/2016 11:43:52 AM
Sample Name     : Outlet Run 3                Location  : Vial 1
Acq. Operator  : JCH
Acq. Instrument : Instrument 1              Inj Volume: External
Method         : C:\HPCHEM\1\METHODS\ETHYDUAL.M
Last changed   : 7/2/2015 1:34:02 PM by JCH
ethylene oxide dual
  
```



```

=====
                          Area Percent Report
=====
  
```

```

Sorted By           :      Signal
Multiplier          :      1.0000
Dilution           :      1.0000
Use Multiplier & Dilution Factor with ISTDs
  
```

Signal 1: FID1 A,

Peak #	RetTime [min]	Type	Width [min]	Area counts*s	Height [counts]	Area %
1	1.443	MM	0.1205	3081.71533	426.29462	1.000e2

```
Totals :                3081.71533  426.29462
```

Results obtained with enhanced integrator!

```

=====
*** End of Report ***
  
```

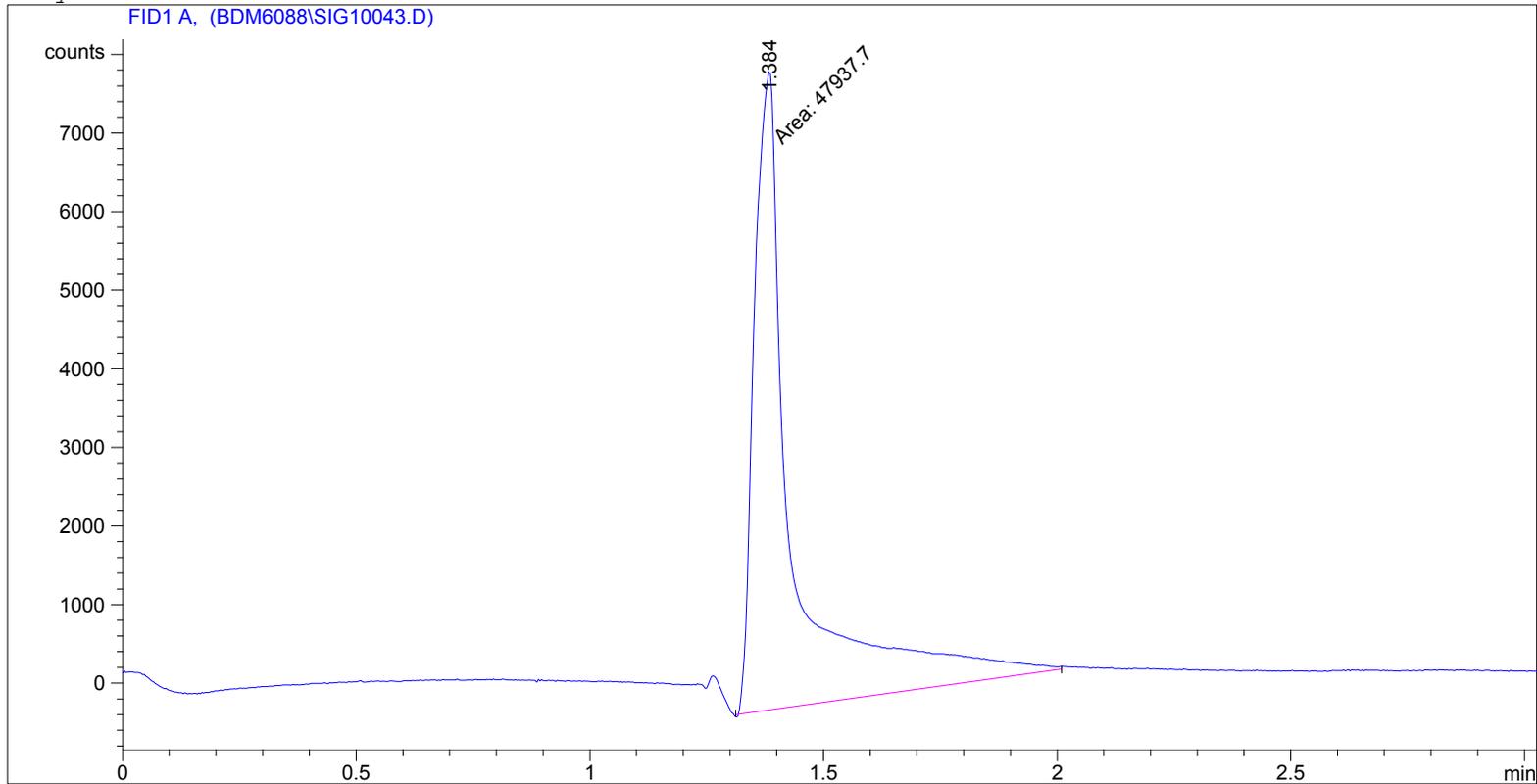
**Outlet Post-Cal**

EO Outlet Post Cal 25.75ppm

```

=====
Injection Date   : 7/15/2016 12:23:25 PM
Sample Name     : Post Cal 25.75           Location  : Vial 1
Acq. Operator   : JCH
Acq. Instrument : Instrument 1             Inj Volume: External
Method          : C:\HPCHEM\1\METHODS\ETHYDUAL.M
Last changed    : 7/2/2015 1:34:02 PM by JCH
ethylene oxide dual

```



```

=====
                          Area Percent Report
=====

```

```

Sorted By           :      Signal
Multiplier          :      1.0000
Dilution            :      1.0000
Use Multiplier & Dilution Factor with ISTDs

```

Signal 1: FID1 A,

Peak #	RetTime [min]	Type	Width [min]	Area counts*s	Height [counts]	Area %
1	1.384	MM	0.0982	4.79377e4	8135.33838	1.000e2

```
Totals :                4.79377e4  8135.33838
```

Results obtained with enhanced integrator!

```

=====
*** End of Report ***

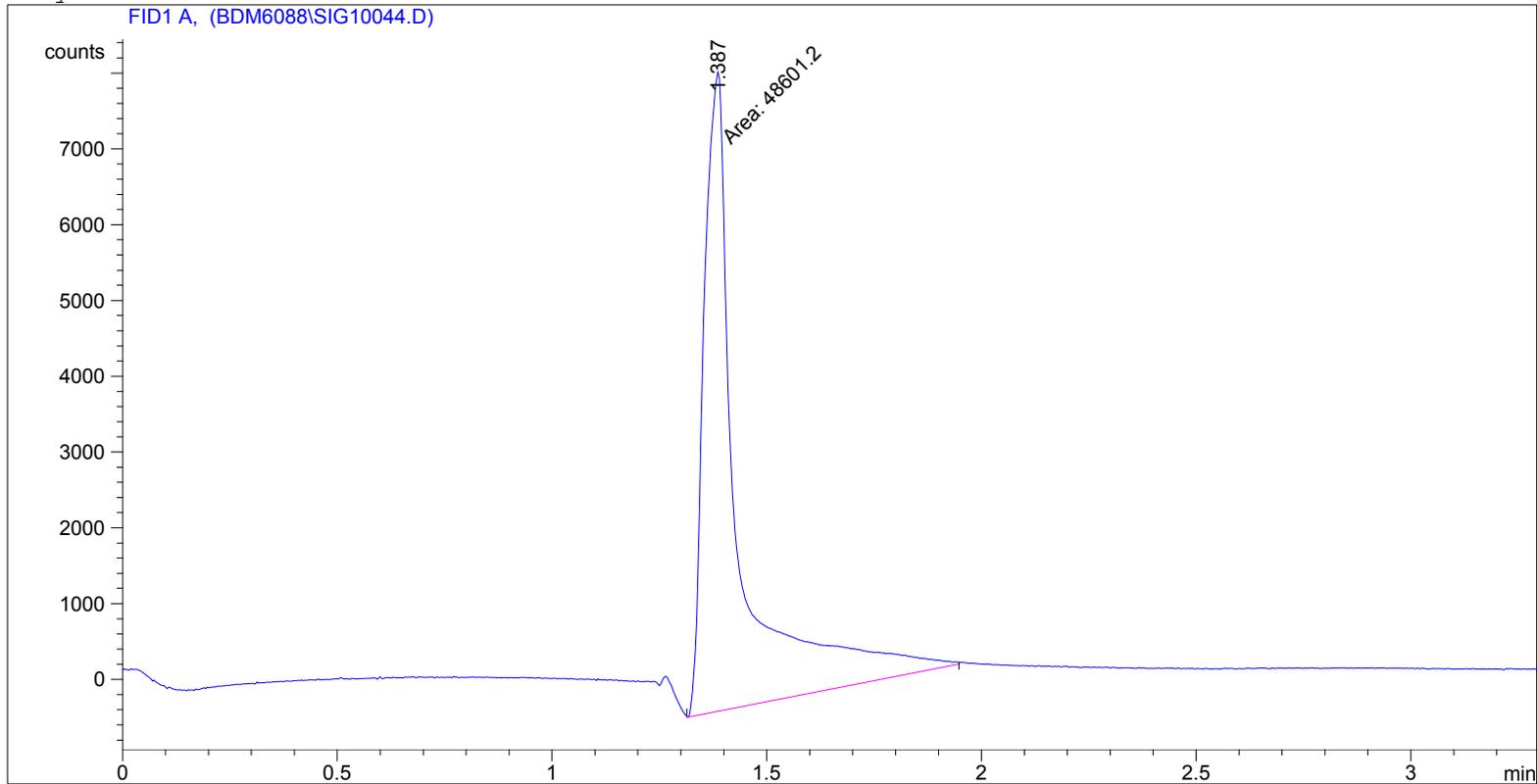
```

EO Outlet Post Cal 25.75ppm

```

=====
Injection Date   : 7/15/2016 12:29:14 PM
Sample Name     : Post Cal 25.75           Location  : Vial 1
Acq. Operator   : JCH
Acq. Instrument : Instrument 1             Inj Volume: External
Method          : C:\HPCHEM\1\METHODS\ETHYDUAL.M
Last changed    : 7/2/2015 1:34:02 PM by JCH
ethylene oxide dual

```



```

=====
                          Area Percent Report
=====

```

```

Sorted By           :      Signal
Multiplier          :      1.0000
Dilution            :      1.0000
Use Multiplier & Dilution Factor with ISTDs

```

Signal 1: FID1 A,

Peak #	RetTime [min]	Type	Width [min]	Area counts*s	Height [counts]	Area %
1	1.387	MM	0.0959	4.86012e4	8448.37012	1.000e2

```
Totals :                4.86012e4  8448.37012
```

Results obtained with enhanced integrator!

```

=====
*** End of Report ***

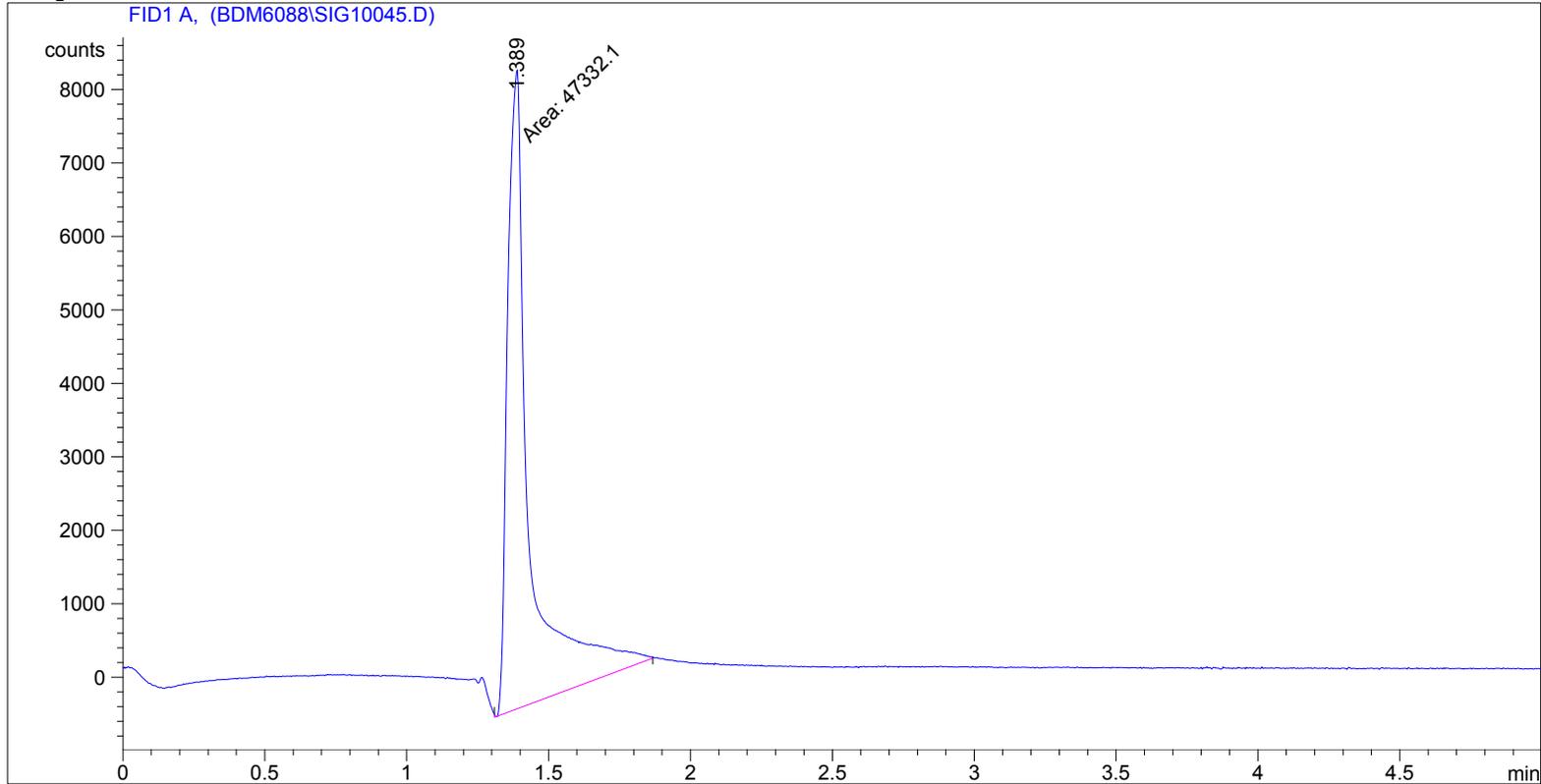
```

EO Outlet Post Cal 25.75ppm

```

=====
Injection Date   : 7/15/2016 12:32:56 PM
Sample Name     : Post Cal 25.75           Location  : Vial 1
Acq. Operator  : JCH
Acq. Instrument : Instrument 1             Inj Volume: External
Method         : C:\HPCHEM\1\METHODS\ETHYDUAL.M
Last changed   : 7/2/2015 1:34:02 PM by JCH
ethylene oxide dual

```



```

=====
                          Area Percent Report
=====

```

```

Sorted By           :      Signal
Multiplier          :      1.0000
Dilution           :      1.0000
Use Multiplier & Dilution Factor with ISTDs

```

Signal 1: FID1 A,

Peak #	RetTime [min]	Type	Width [min]	Area counts*s	Height [counts]	Area %
1	1.389	MM	0.0904	4.73321e4	8729.40137	1.000e2

```
Totals :                4.73321e4  8729.40137
```

Results obtained with enhanced integrator!

```

=====
*** End of Report ***

```



Appendix Three: Calibration Information

**DRY GAS METER AND PYROMETER PRE-CALIBRATION DATA**

Gas Meter ID.....	M5-27
Date.....	2/29/2016
Barometric Pressure (MBAR).....	833
Technician.....	DM

**Reference Meter Calibration Data**

	Run #1	Run #2	Run #3	Average
Yref	0.993	0.993	0.993	<b>0.993</b>
Yd	0.980	1.003	1.012	<b>0.998</b>
DH@	1.64	1.66	1.66	<b>1.65</b>
Pre Yd.....	<b>0.998</b>			

Reference Meter ID.....	2
Reference Meter S/N.....	6844262
Reference Meter Yd.....	0.993
Calibration Date.....	1/19/2016
APT Recert Date.....	1/19/2017

**Dry Gas Meter Calibration Data**

Run #1	Delta H @ ("H <sub>2</sub> O)	Volume Meter (feet <sup>3</sup> )	Temp. In (°F)	Temp. Out (°F)	Volume Reference (feet <sup>3</sup> )	Temp. Ref. (°F)	Delta P ("H <sub>2</sub> O)	Vacuum ("Hg)	Time (min)
Start	0.5	138.184	74	72	376.125	67	0.49	19	10:08 AM
Stop	0.5	162.470	72	72	399.928	68	0.47	19	11:00 AM
Average	<b>0.5</b>	<b>24.286</b>	<b>73</b>	<b>72</b>	<b>23.803</b>	<b>68</b>	<b>0.48</b>	<b>19</b>	<b>52.0</b>

Run #2	Delta H @ ("H <sub>2</sub> O)	Volume Meter (feet <sup>3</sup> )	Temp. In (°F)	Temp. Out (°F)	Volume Reference (feet <sup>3</sup> )	Temp. Ref. (°F)	Delta P ("H <sub>2</sub> O)	Vacuum ("Hg)	Time (min)
Start	1.5	163.726	72	72	401.095	67	1.15	16	11:02 AM
Stop	1.5	188.779	76	73	426.327	68	1.15	16	11:34 AM
Average	<b>1.5</b>	<b>25.053</b>	<b>74</b>	<b>73</b>	<b>25.232</b>	<b>68</b>	<b>1.15</b>	<b>16</b>	<b>32.0</b>

Run #3	Delta H @ ("H <sub>2</sub> O)	Volume Meter (feet <sup>3</sup> )	Temp. In (°F)	Temp. Out (°F)	Volume Reference (feet <sup>3</sup> )	Temp. Ref. (°F)	Delta P ("H <sub>2</sub> O)	Vacuum ("Hg)	Time (min)
Start	3.0	190.387	76	73	427.965	68	2.05	13.5	11:36 AM
Stop	3.0	219.914	81	74	458.026	67	2.05	13.5	12:03 PM
Average	<b>3.0</b>	<b>29.527</b>	<b>79</b>	<b>74</b>	<b>30.061</b>	<b>68</b>	<b>2.05</b>	<b>14</b>	<b>27.0</b>

Pitot Leak Check	
0.00 @ 3" H <sub>2</sub> O Positive.....	x
0.00 @ 3" H <sub>2</sub> O Negative.....	x

System Response Check			
T/C Out (5).....	x	Pump In.....	x
Filter In.....	x	Aux In.....	x

Visual System Check	
Manometer Oil Levels.....	x
Physical Inspection.....	x

**Pyrometer Calibration Data**

Calibration Temp. Reading (F)	Pyrometer Reading (F)	ABS (Relative Difference) % R
0	1	0.2
50	49	0.2
100	99	0.2
150	149	0.2
250	251	0.1
500	499	0.1
800	802	0.2
Max Absolute Difference %.....	0.2	

Omega Temp Calibrator ID.....	1
Omega Temp Calibrator S/N.....	T-197197
Calibration Date.....	7/7/2015
Recert Date.....	7/7/2016

**DRY GAS METER AND PYROMETER POST-CALIBRATION DATA**

Gas Meter ID.....	M5-27
Date.....	7/20/2016
Barometric Pressure (MBAR).....	841
Technician.....	Phil Brock

**Reference Meter Calibration Data**

	Run #1	Run #2	Run #3	Average
Yref	0.996	0.996	0.996	<b>0.996</b>
Yd	0.996	0.995	0.995	<b>0.995</b>
DH@	1.66	1.66	1.64	<b>1.65</b>
Calibration Results.....				<b>0.3%</b>

M-5 box Pre Yd.....	0.998
Reference Meter ID.....	1
Reference Meter S/N.....	18654610
Reference Meter Yd.....	0.996
Calibration Date.....	12/22/2015
APT Recert Date.....	12/22/2016

**Dry Gas Meter Calibration Data**

Run #1	Delta H @ ("H <sub>2</sub> O)	Volume Meter (feet <sup>3</sup> )	Temp. In (°F)	Temp. Out (°F)	Volume Reference (feet <sup>3</sup> )	Temp. Ref. (°F)	Delta P ("H <sub>2</sub> O)	Vacuum ("Hg)	Time (min)
Start	1.5	396.000	75	75	108.001	74	1.15	15.0	6:30 AM
Stop	1.5	414.827	76	75	126.924	74	1.15	15.0	6:54 AM
Average	1.5	18.827	76	75	18.923	74	1.15	15.0	24.0

Run #2	Delta H @ ("H <sub>2</sub> O)	Volume Meter (feet <sup>3</sup> )	Temp. In (°F)	Temp. Out (°F)	Volume Reference (feet <sup>3</sup> )	Temp. Ref. (°F)	Delta P ("H <sub>2</sub> O)	Vacuum ("Hg)	Time (min)
Start	1.5	414.827	76	75	126.924	74	1.15	15.0	7:00 AM
Stop	1.5	441.593	79	77	153.779	76	1.15	15.0	7:34 AM
Average	1.5	26.766	78	76	26.855	75	1.15	15.0	34.0

Run #3	Delta H @ ("H <sub>2</sub> O)	Volume Meter (feet <sup>3</sup> )	Temp. In (°F)	Temp. Out (°F)	Volume Reference (feet <sup>3</sup> )	Temp. Ref. (°F)	Delta P ("H <sub>2</sub> O)	Vacuum ("Hg)	Time (min)
Start	1.5	441.593	79	77	153.779	76	1.15	15.0	7:38 AM
Stop	1.5	470.212	81	79	182.424	76	1.15	15.0	8:14 AM
Average	1.5	28.619	80	78	28.645	76	1.15	15.0	36.0

Pitot Leak Check	
0.00 @ 3" H <sub>2</sub> O Positive.....	x
0.00 @ 3" H <sub>2</sub> O Negative.....	x

System Response Check			
T/C Out (5).....	x	Pump In.....	x
Filter In.....	x	Aux In.....	x

Visual System Check	
Manometer Oil Levels.....	x
Physical Inspection.....	x

**Pyrometer Calibration Data**

Calibration Temp. Reading (F)	Pyrometer Reading (F)	ABS (Relative Difference) % R
0	1	0.2
50	49	0.2
100	99	0.2
150	149	0.2
250	251	0.1
500	499	0.1
800	802	0.2
Max Absolute Difference %.....	0.2	

Omega Temp Calibrator ID.....	2
Omega Temp Calibrator S/N.....	T-293650
Calibration Date.....	8/21/2015
Recert Date.....	8/21/2016



# Wind Tunnel Pitot Calibration

S-type Pitot ID: **P-882** Date: **7-Jun-14**  
 Standard Pitot ID: **001** Personnel: **DH**  
 Cp(std): **0.99** Cp(actual): **0.837**  
 Part Number: **PPS12-Y-007.5** P<sub>bar</sub>(in Hg): **29.59**  
 Test Velocity (fps): **50** T(°F): **74**

A-SIDE	$\Delta P_{std}$ (in. H <sub>2</sub> O)	$\Delta P_s$ (in. H <sub>2</sub> O)	Cp(s)	Deviation*
	0.543	0.760	0.837	0.000
	0.539	0.758	0.835	-0.002
	0.541	0.758	0.837	0.000
	0.543	0.756	0.839	0.002
<b>AVERAGE</b>			<b>0.837</b>	0.001
			Std deviation	0.002

B-SIDE	$\Delta P_{std}$ (in. H <sub>2</sub> O)	$\Delta P_s$ (in. H <sub>2</sub> O)	Cp(s)	Deviation*
	0.541	0.762	0.834	-0.003
	0.541	0.755	0.838	0.000
	0.546	0.759	0.840	0.002
	0.544	0.757	0.839	0.001
<b>0.7621</b>			<b>0.838</b>	0.002
			Std deviation	0.002

$$Cp(s) = Cp(std) \sqrt{\frac{\Delta P(std)}{\Delta P(s)}}$$

Cp(A) - Cp(B) = **0.001** {must be <0.010}

\*Deviation = {Cp(s) - AVG Cp(s)} {must be <0.010}

Standard deviation of the deviations must be less than 0.02 for both sides.

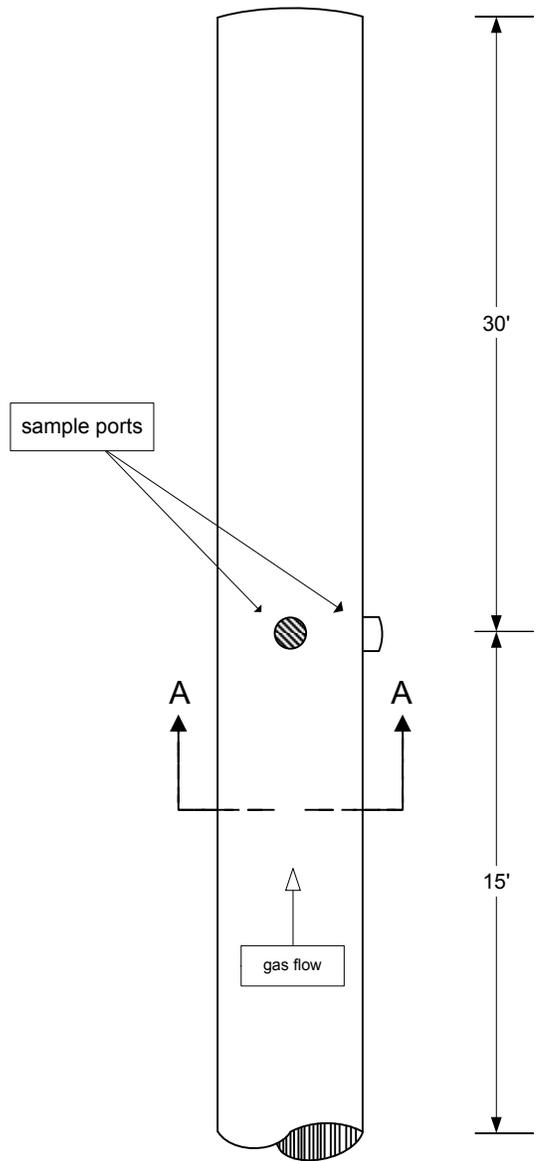
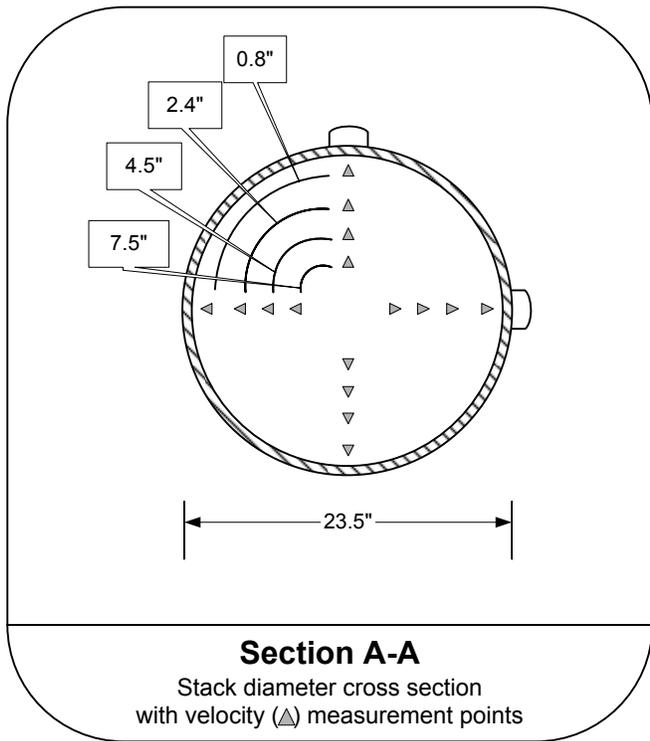
Pitot tube S/N P-882 was calibrated in accordance with the CFR 40, Part 60 Appendix A, Method 2, Section 10.

  
 Signature

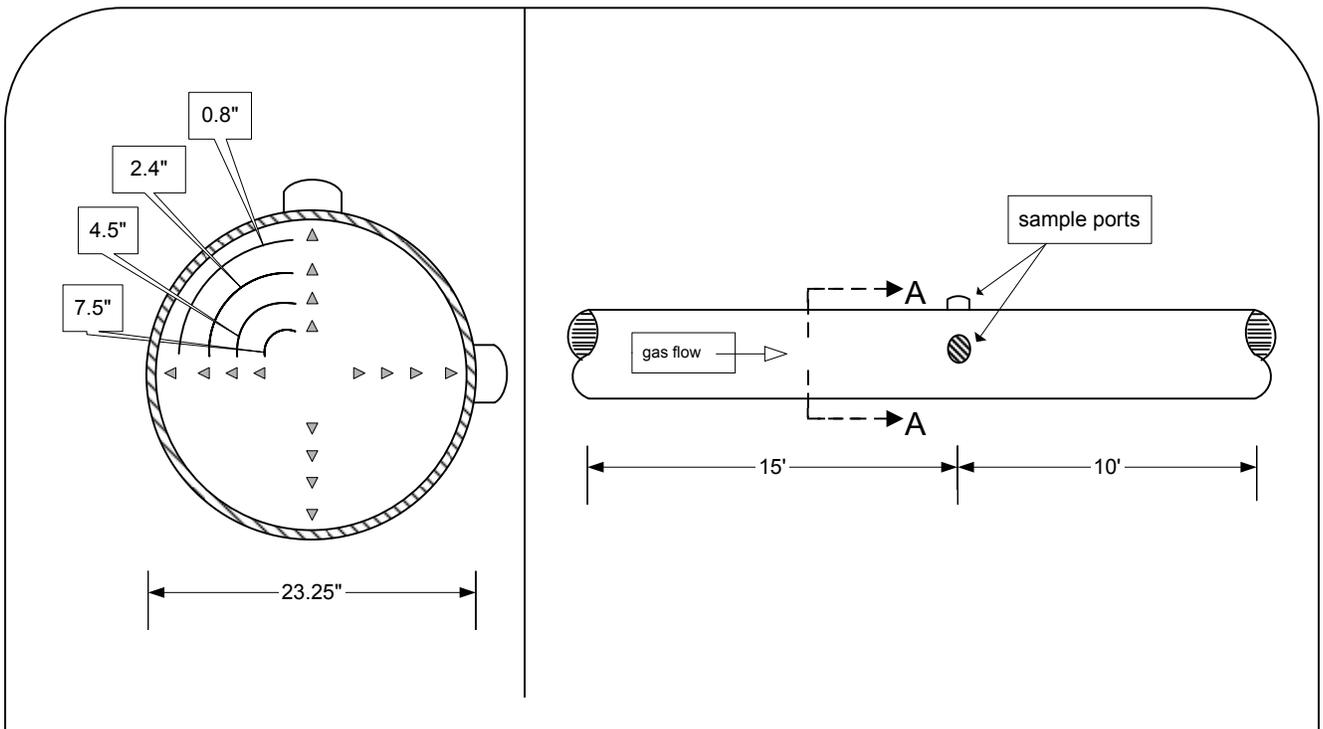
**6/7/14**  
 Date



Appendix Four: Schematics



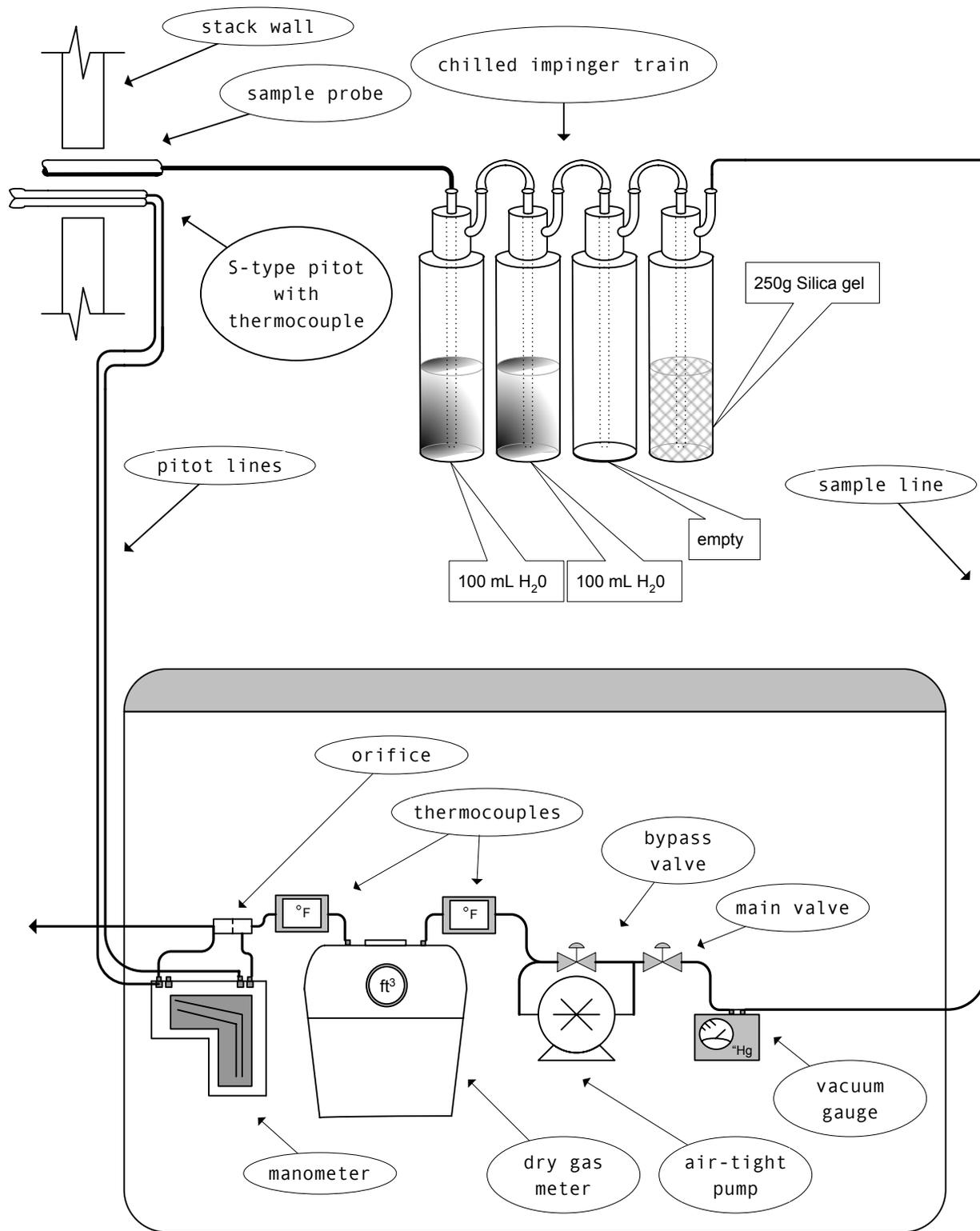
BD Medical - Columbus, Nebraska  
Ethylene Oxide Sterilization Chamber - Catalytic Oxidizer (Outlet)  
Stack Sampling Location Schematic  
(not to scale)



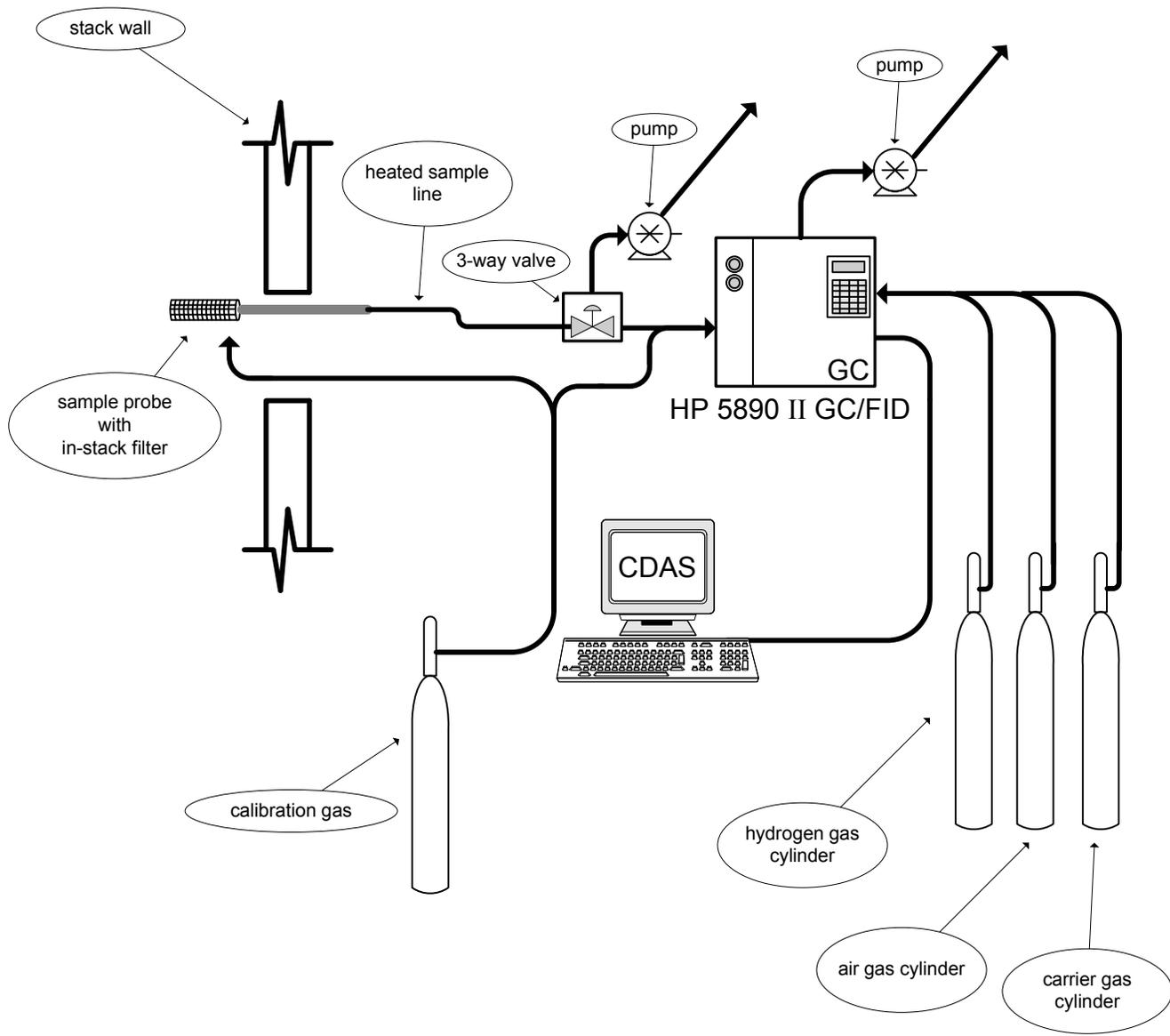
**Section A-A**

Stack diameter cross section  
with velocity measurement points (▲)

BD Medical - Columbus, Nebraska  
Ethylene Oxide Sterilization Chamber - Catalytic Oxidizer (Inlet)  
Stack Sampling Location Schematic  
(not to scale)



EPA Methods 1, 2, & 4  
sampling train schematic

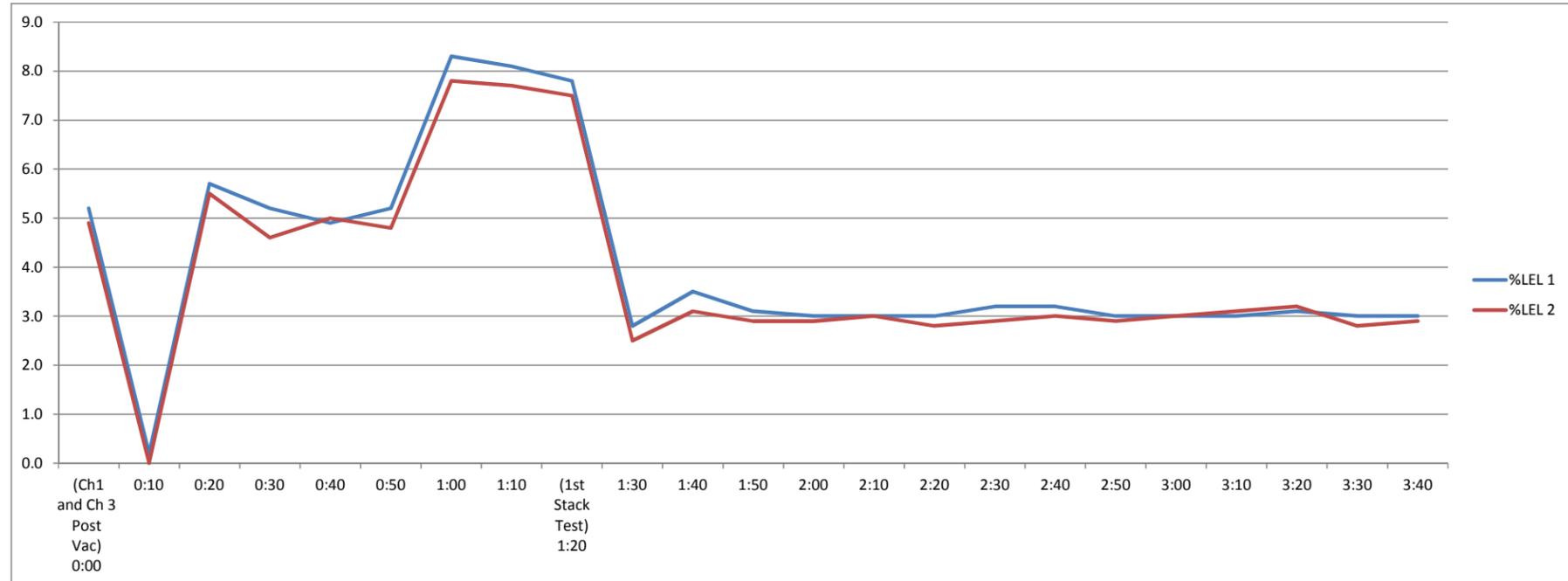
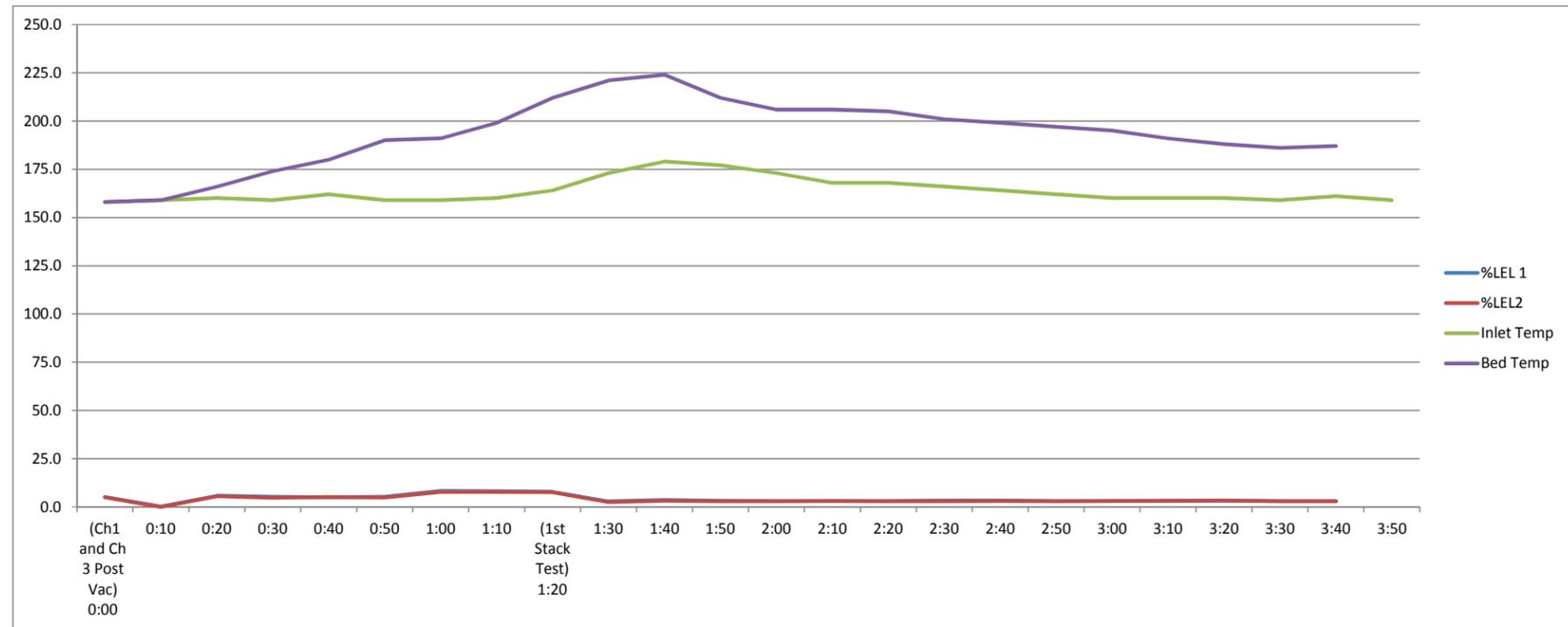


EPA Method 18  
sampling train schematic

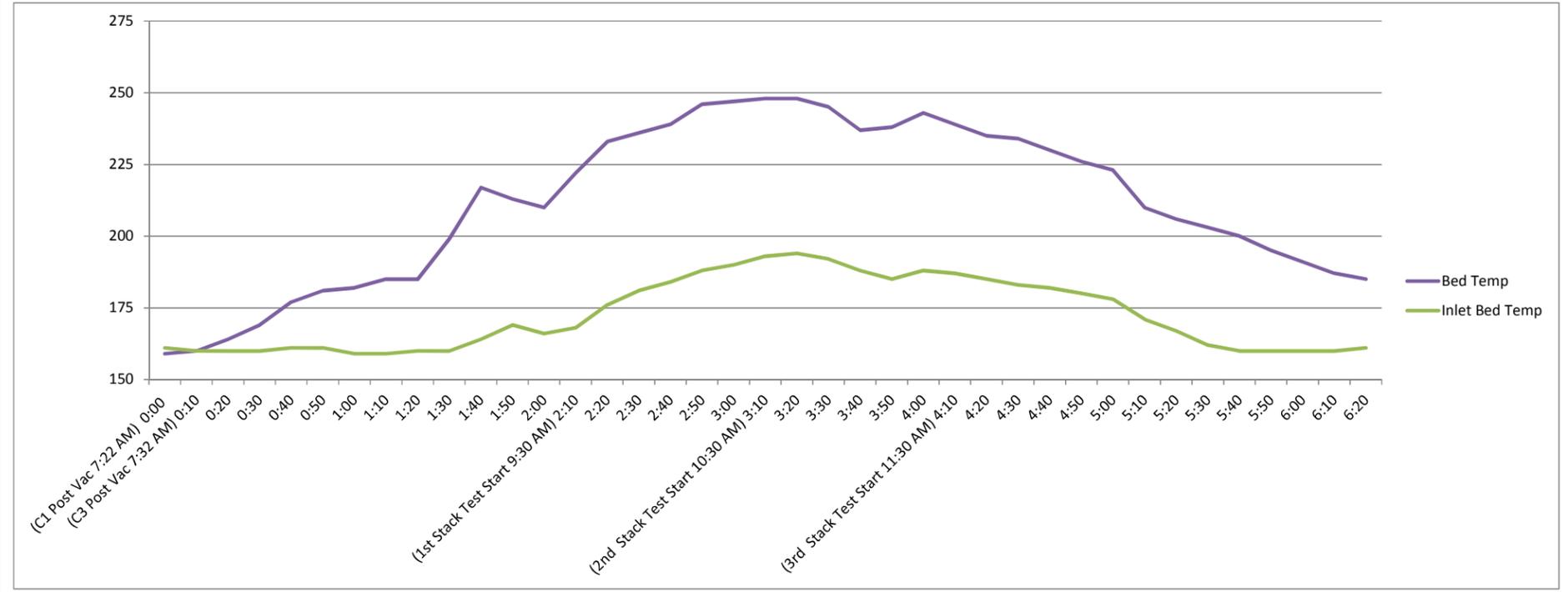


Appendix Five: Operating Data

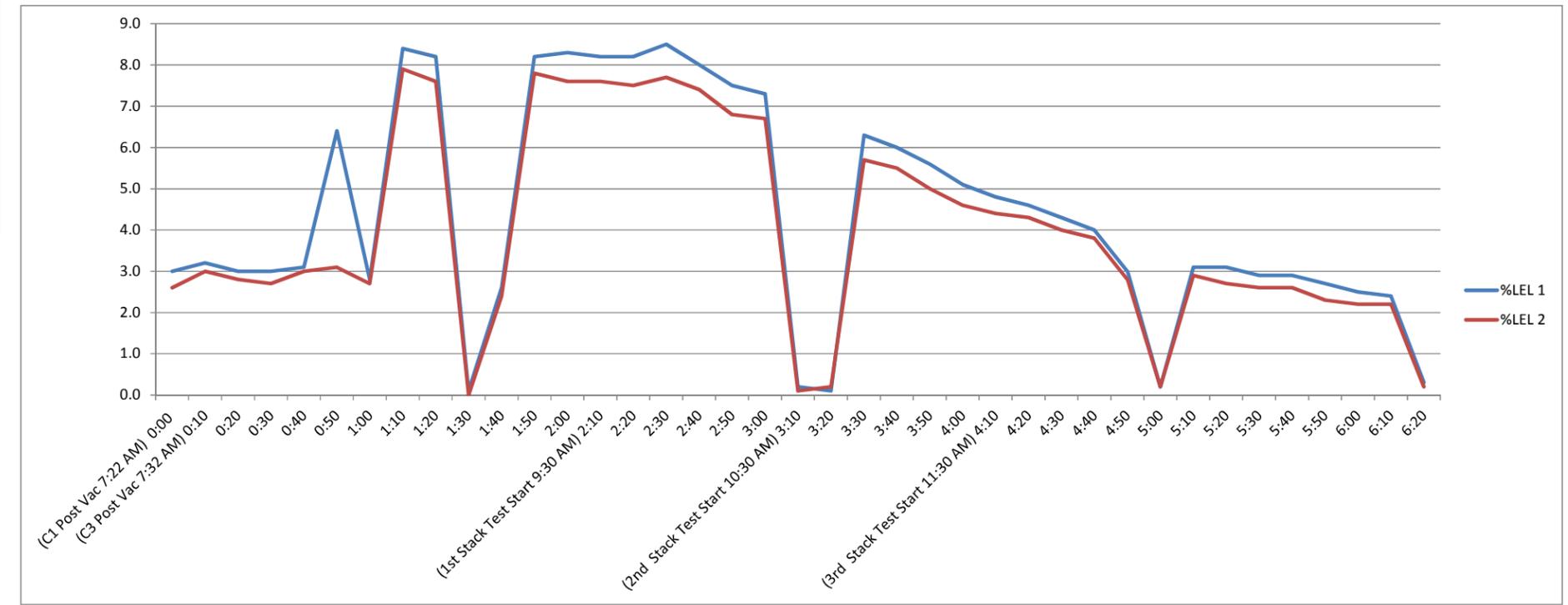
2016 Stack Test----Pre Test					
Cycle Time	% LEL 30.630	% LEL 30.633	Inlet Bed Temp	Outlet Bed Temp	Clock Time
<b>(Ch1 and Ch 3 Post Vac) 0:00</b>					
0:10	5.2	4.9	158	158	1:25 PM
0:20	0.2	0	159	159	1:35 PM
0:30	5.7	5.5	160	166	1:55 PM
0:40	5.2	4.6	159	174	2:05 PM
0:50	4.9	5	162	180	2:15 PM
1:00	5.2	4.8	159	190	2:25 PM
1:10	8.3	7.8	159	191	2:35 PM
<b>(1st Stack Test) 1:20</b>					
1:30	8.1	7.7	160	199	2:45 PM
1:40	7.8	7.5	164	212	2:55 PM
1:50	2.8	2.5	173	221	3:05 PM
2:00	3.5	3.1	179	224	3:15 PM
2:10	3.1	2.9	177	212	3:25 PM
2:20	3.0	2.9	173	206	3:35 PM
2:30	3.0	3	168	206	3:45 PM
2:40	3.0	2.8	168	205	3:55 PM
2:50	3.2	2.9	166	201	4:05 PM
3:00	3.2	3.0	164	199	4:15 PM
3:10	3.0	2.9	162	197	4:25 PM
3:20	3.0	3.0	160	195	4:35 PM
3:30	3.0	3.1	160	191	4:45 PM
3:40	3.1	3.2	160	188	4:55 PM
3:50	3.0	2.8	159	186	5:05 PM
4:00	3.0	2.9	161	187	5:15 PM
4:10	3.3	3.0	159	187	5:25 PM
4:20	3.2	2.8	160	187	5:35 PM
4:30	3.1	2.9	160	187	5:45 PM
4:40	3.1	2.9	160	187	5:55 PM
4:50	3.2	2.9	159	187	6:05 PM
4:50	3	2.8	160	186	6:15 PM



2016 Stack Test 7/15/2016					
Cycle Time	% LEL	% LEL	Inlet Bed Temp	Outlet Bed Temp	Clock Time
(C1 Post Vac 7:22 AM) 0:00					
(C3 Post Vac 7:32 AM) 0:10	3.0	2.6	161	159	7:20 AM
0:20	3.2	3.0	160	160	7:30 AM
0:30	3.0	2.8	160	164	7:40 AM
0:40	3.0	2.7	160	169	7:50 AM
0:50	3.1	3.0	161	177	8:00 AM
1:00	6.4	3.1	161	181	8:10 AM
1:10	2.8	2.7	159	182	8:20 AM
1:20	8.4	7.9	159	185	8:30 AM
1:30	8.2	7.6	160	185	8:40 AM
1:40	0.1	0.0	160	199	8:50 AM
1:50	2.6	2.4	164	217	9:00 AM
2:00	8.2	7.8	169	213	9:10 AM
(1st Stack Test Start 9:30 AM) 2:10	8.3	7.6	166	210	9:20 AM
2:20	8.2	7.6	168	222	9:30 AM
2:30	8.2	7.5	176	233	9:40 AM
2:40	8.5	7.7	181	236	9:50 AM
2:50	8.0	7.4	184	239	10:00 AM
3:00	7.5	6.8	188	246	10:10 AM
(2nd Stack Test Start 10:30 AM) 3:10	7.3	6.7	190	247	10:20 AM
3:20	0.2	0.1	193	248	10:30 AM
3:30	0.1	0.2	194	248	10:40 AM
3:40	6.3	5.7	192	245	10:50 AM
3:50	6.0	5.5	188	237	11:00 AM
4:00	5.6	5.0	185	238	11:10 AM
(3rd Stack Test Start 11:30 AM) 4:10	5.1	4.6	188	243	11:20 AM
4:20	4.8	4.4	187	239	11:30 AM
4:30	4.6	4.3	185	235	11:50 AM
4:40	4.3	4.0	183	234	12:00 PM
4:50	4.0	3.8	182	230	12:10 PM
5:00	3.0	2.8	180	226	12:20 PM
5:10	0.2	0.2	178	223	12:30 PM
5:20	3.1	2.9	171	210	12:40 PM
5:30	3.1	2.7	167	206	12:50 PM
5:40	2.9	2.6	162	203	1:00 PM
5:50	2.9	2.6	160	200	1:10 PM
6:00	2.7	2.3	160	195	1:20 PM
6:10	2.5	2.2	160	191	1:30 PM
6:20	2.4	2.2	160	187	1:40 PM
6:30	0.3	0.2	161	185	1:50 PM



Installed new LEL sensors to monitor and regulate the flow of EO going to the abator. Normally set to maintain 3%LEL during normal production, but increased to 8%LEL so we could properly determine the effectiveness of the Lesni.



2015 Stack Test 7/31/2015					
Cycle Time	% LEL	% LEL	Inlet Bed Temp	Outlet Bed Temp	Clock Time
(C1 Post Vac 6:30 AM) 0:00	-0.4	1.6	160	159	6:30 AM
0:10	-0.4	2.3	160	159	6:40 AM
0:20	0.0	2.7	161	159	6:50 AM
0:30	0.0	2.7	161	161	7:00 AM
0:40	-0.4	5.2	160	164	7:10 AM
0:50	2.7	4.1	159	166	7:20 AM
(C2 Post Vac 7:30 AM) 1:00	-0.5	4.4	159	169	7:30 AM
1:10	4.9	5.8	161	176	7:40 AM
1:20	2.2	5.0	159	176	7:50 AM
1:30	3.3	6.2	161	178	8:00 AM
1:40	5.6	5.6	161	184	8:10 AM
1:50	-0.2	5.5	159	184	8:20 AM
(C3 Post Vac 8:30 AM) 2:00	0.0	5.3	160	185	8:30 AM
2:10	3.6	6.4	159	190	8:40 AM
2:20	3.7	5.9	159	191	8:50 AM
2:30	3.8	7.6	161	195	9:00 AM
2:40	4.9	9.5	160	200	9:10 AM
2:50	6.0	7.3	164	204	9:20 AM
(1st Stack Test Start 9:30 AM) 3:00	4.1	8.6	165	207	9:30 AM
3:10	8.9	9.2	171	217	9:40 AM
3:20	5.4	8.6	174	216	9:50 AM
3:30	7.8	8.5	180	229	10:00 AM
3:40	6.1	9.4	182	231	10:10 AM
3:50	4.4	8.7	185	232	10:20 AM
(2nd Stack Test Start 10:30 AM) 4:00	8.1	8.4	188	237	10:30 AM
4:10	6.2	7.6	191	239	10:40 AM
4:20	7.5	10.2	193	243	10:50 AM
4:30	11.1	8.4	192	244	11:00 AM
4:40	5.5	7.8	195	245	11:10 AM
4:50	7.6	8.6	194	237	11:20 AM
5:00	11.3	11.6	194	243	11:30 AM
5:10	-1.7	2.3	191	248	11:40 AM
5:20	-1.7	2.5	190	249	11:50 AM
5:30	-2.1	2.4	190	249	12:00 PM
5:40	-2.0	2.4	178	214	12:10 PM
5:50	-1.5	2.4	168	204	12:20 PM
(3rd Stack Test Start 12:30 PM) 6:00	8.1	8.4	168	199	12:30 PM
6:10	7.3	9.1	163	192	12:40 PM
6:20	8.4	10.1	164	209	12:50 PM
6:30	8.1	8.2	175	225	1:00 PM
6:40	9.3	8.7	180	227	1:10 PM
6:50	7.4	10.0	183	229	1:20 PM
7:00	6.4	7.4	185	231	1:30 PM
7:10	7.1	7.2	187	234	1:40 PM
7:20	6.8	6.4	188	235	1:50 PM

Convert %LEL to PPM  
30000 = LEL  
5% LEL = .05 X 30000 = 1500 ppm

